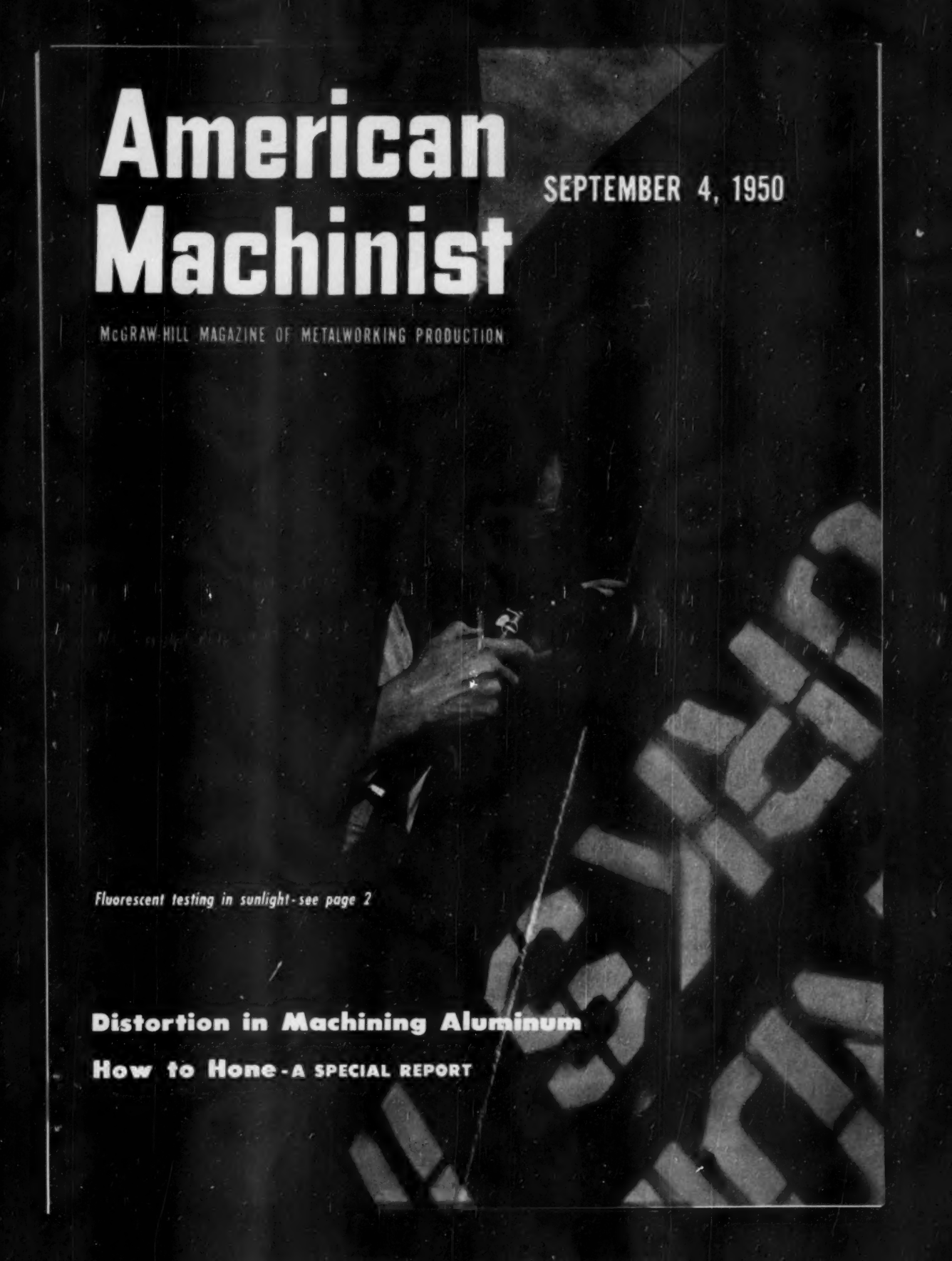
American Machinist

SEPTEMBER 4, 1950

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Fluorescent testing in sunlight - see page 2

Distortion in Machining Aluminum

How to Hone - A SPECIAL REPORT

pinning down your up-keep costs

As a factor of production cost, maintenance is a two-edged sword. For every hour spent on machine servicing means an hour's production lost.

That's why reduced maintenance was a major factor in designing *every detail* of the new line of Heald precision finishing machines, from top to bottom.

Take the new Red Head boringheads and wheelheads, for example. They're lubricated for life! The right amount of the right lubricant is permanently sealed in, right at the Heald plant. In addition, all other basic machine parts are automatically lubricated — eliminating the uncertainty of the human element from this vital phase of machine maintenance and reducing down-time for service.

The time and expense of routine inspection — as well as infrequent servicing — have been still further cut by Heald's unique pull-out power unit. This makes the entire power plant — motors, pumps and tanks — easy to get at from any angle.

These and many other design improvements are Heald's answer to the perennial problem of machine maintenance. It's an answer that means more production and higher precision, at substantially lower over-all cost.

Remember — when it comes to precision finishing, it pays to come to Heald.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

HEALD

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

Thumbs Down

"It's time for us to scoop competition again," said this leading tricycle manufacturer. His designers came up with an all-magnesium model.

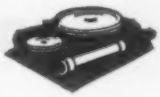
The president loved it. It was far lighter. But he turned thumbs down on magnesium

because he'd had no experience with it. To convince the boss, these designers came to Aluminum Company of America,

light-metal headquarters. They found that over three million pounds of magnesium were used every month. They found that any shop can handle magnesium by following simple procedures.

They found answers to design and fabrication problems in Alcoa books.

And that Alcoa foundries would cast magnesium fittings



at very attractive prices.

These two free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, 2106J Gulf Building, Pittsburgh 19, Pa. Sales offices in principal cities.

ALCOA ALUMINUM MAGNESIUM

CONE WHEEL SMOOTHS OUT DIE MARKS 200% FASTER

IN grinding die marks from the inside of pressure tanks, this manufacturer was using straight type 4500 R.P.M. grinders with 6" x 2" x ⅝" vitrified wheels. The wheels cut grooves into the tank on either side of the die marks, causing failures under test.

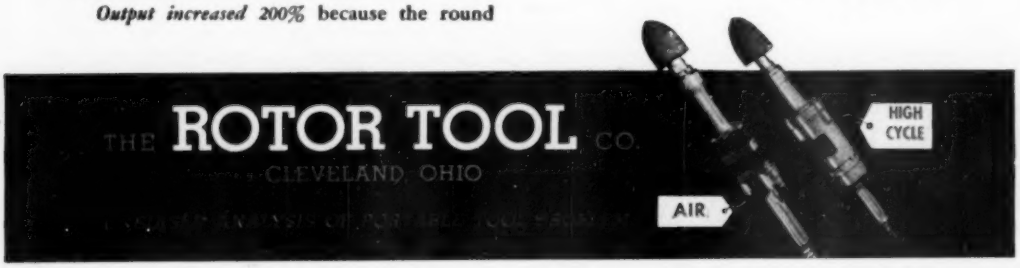
When called in, the Rotor Application Engineer recommended 8500 R.P.M. Rotor Air Grinders with 2¼" x 3½" x ⅜" resinoid bond cone wheel, round nose. Result:

Output increased 200% because the round nose cone wheel could be held on the die marks without cutting into the tank wall . . . and because of the faster cutting of the resinoid wheel and the higher speed.

Now the inspector says, "OK," every time.

How about *your* portable tool problems? We'd like to tackle them!

AIR O'TOOL



American Machinist

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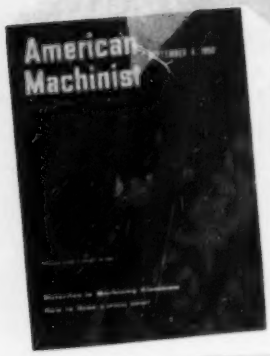


Chips and QUIPS

Fluorescent Test . . . The inspector on our cover is using a newly developed tool, called the "Fluoretor", to check welds in tanks. Weld surfaces are swabbed with fluorescent oil, washed, and coated with developing fluid. The Fluoretor is simply an ultraviolet-light source with its own dark chamber, so fluorescent indications of cracks and fissures can be detected, even in sunlight. A sponge-rubber cone seals the dark chamber over irregularities. The tool itself was described in *AM* for Aug. 21. It is made by Menlo Research Laboratory, Menlo Park, Calif.

Aluminum Distortion . . . Why does aluminum change shape so much during manufacture? That's the subject of our lead article by Dr. K. R. Van Loon of Alcoa. He points out the four important causes of distortion and explains in detail how you can avoid those conditions. By the way, how can you illustrate distortion? We could use curves and graphs, but perhaps the cartoons with the article will help put across Dr. Van Loon's points.

Honing . . . This once was strictly a finishing process, but nowadays it can often compete with grinding as a stock-removal process. Sometimes it is faster and cheaper, and it is almost always more accurate. Associate Editor H. E. Linsley contacted the four leading producers of honing equipment and got together the latest and best information and opinions on the subject to make our current Special Report. The point about honing is that it doesn't require an intricate machine with built-in precision. The head does the work and controls the cut, too.

Quickies . . . About the most efficient way to present Metalworking information, we have found, is the two-page spread—two pages facing each other. With this kind of layout, you can see all the information in the article at one quick glance. Even if you don't want to read all the detailed information, you can get the main ideas in a hurry by reading the head (or headline), the blurb (or deck paragraph), and the captions. Then, if you want to get the details, you can back-track without turning a page and read the whole article. Sometimes, the captions tell the whole story and the usual text is not required.

Included in the quickies are: one on how Talon, Inc., keeps its presses in tip-top shape with planned reconditioning, one on how Nordberg Mfg. Co. welds piston-ring carriers for large engines; one on a compression-reduction process that hot-finishes stock to accurate internal shapes; and one on how Bell Aircraft makes templets in a hurry to reduce production costs. In addition, there is a short article on special screw-machine tricks that Monroe Calculating Machine has found to increase flexibility, and a 1-pager full of facts on what *engineering* management can do to cut costs.

Fixtures . . . They can make a lot of difference in the atmosphere in a plant. Good ones keep production high, and boost morale—as Buick proved again when they gave their tool-engineer department a go-ahead signal on designing fixtures. No crackpot ideas allowed.

Efficient Milling . . . Mario Martellotti concludes his series of articles on selecting milling processes with a fifth installment on transferring and indexing methods, as well as rotary milling, which often can reduce production time on small parts.

Coming . . . Sept 18 *AM* will have a feature article on electronic gaging, one of the most promising advances in inspection and control in a long time. There's a Special Report on coolants, too, including some information that will open a lot of eyes in a lot of production shops. Another Talented Tooling spread, a short article on silver brazing, and a story on estimating cycle and production time for automatics will help fill out your quota of information.

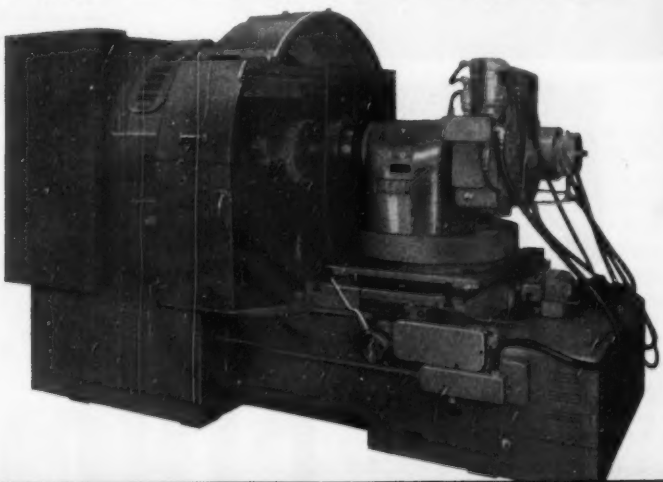
HEAT TREATER . . . Edward C. Bishop was born in Manila, P.I., in 1919 and received his elementary school education in that city. He attended Phillips Andover Academy in Massachusetts and studied metallurgy at M.I.T., from which he received bachelor's and master's degrees in 1941 and 1942 respectively. From that time until early 1946 he was an officer in the Corps of Engineers during World War II, serving in the Aleutians and Okinawa, and retiring with the rank of captain. Mr. Bishop has been employed since by the Westinghouse Electric Corp. in its Materials Engineering Dept. where for several years he directed development work on the applications of controlled atmospheres to the heat-treatment of metals and alloys. He is at present in charge of a pilot plant engaged in the manufacture of alloys for high-temperature service, and is the author of our Aug. 21 Special Report on carbon restoration.

TO MAKE LARGE UNITS, EASIER TO MACHINE, EASIER TO ASSEMBLE, EASIER TO REPLACE

GROUND FROM THE SOLID

WITH THE GLEASON NO. 19 CURVIC COUPLING GRINDER

Built-up units employing the principle of the permanent coupling provide a simplified self-centering means of assembly. The teeth of such a unit carry the torque load. Individual parts are manufactured in high production quantities at low cost—held to the extremely close tolerances so vitally necessary in this type of application—and accurately balanced. In addition, interchangeable units allow "in the field" maintenance. In turbines, for example, such as the compressor rotor for an aircraft gas turbine engine shown here, the fixed coupling teeth between each stage join these sections with perfect alignment.



Write for "Gleason Curvic Couplings" which illustrates many of the various types of clutches and couplings capable of being produced on the Gleason No. 19 Curvic Grinder.

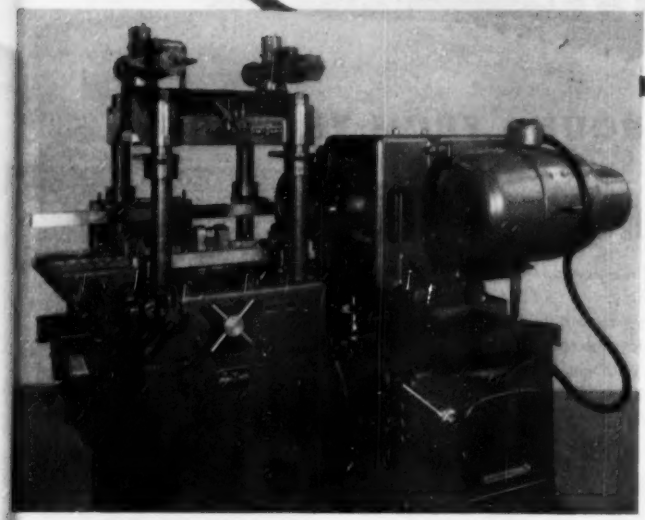
GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over 85 Years

Putting the Cart before the Horse

CINCINNATI

REDUCED THE COST OF CYLINDER BLOCK MILLING OPERATION

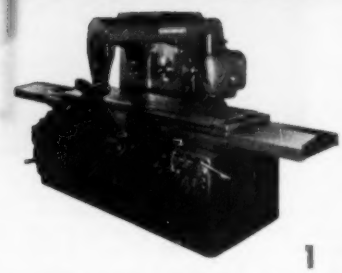


Familiar units comprise this CINCINNATI special purpose miller. In this view, a cylinder block is clamped in position for the milling operation.

Operator's working station, showing comparative simplicity of CINCINNATI special purpose miller.

PRODUCTION DATA

Part Name	Cylinder block
Material	Cast iron
Operation	Mill flywheel end square with crankshaft bearing
Cutting Speed	300 feet per minute
Feed	25" per minute
Production	30 per hour



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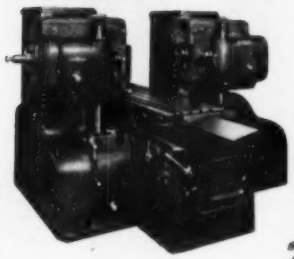

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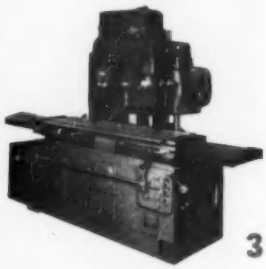


3

THE CINCINNATI HYDROMATIC LINE:

Plain and Duplex styles, conventional and tracer controlled types, 18 sizes of each, 24" to 90" table traverse, 10 hp to 50 hp drive, standard and complementary unit construction for flexibility in building single purpose machines.

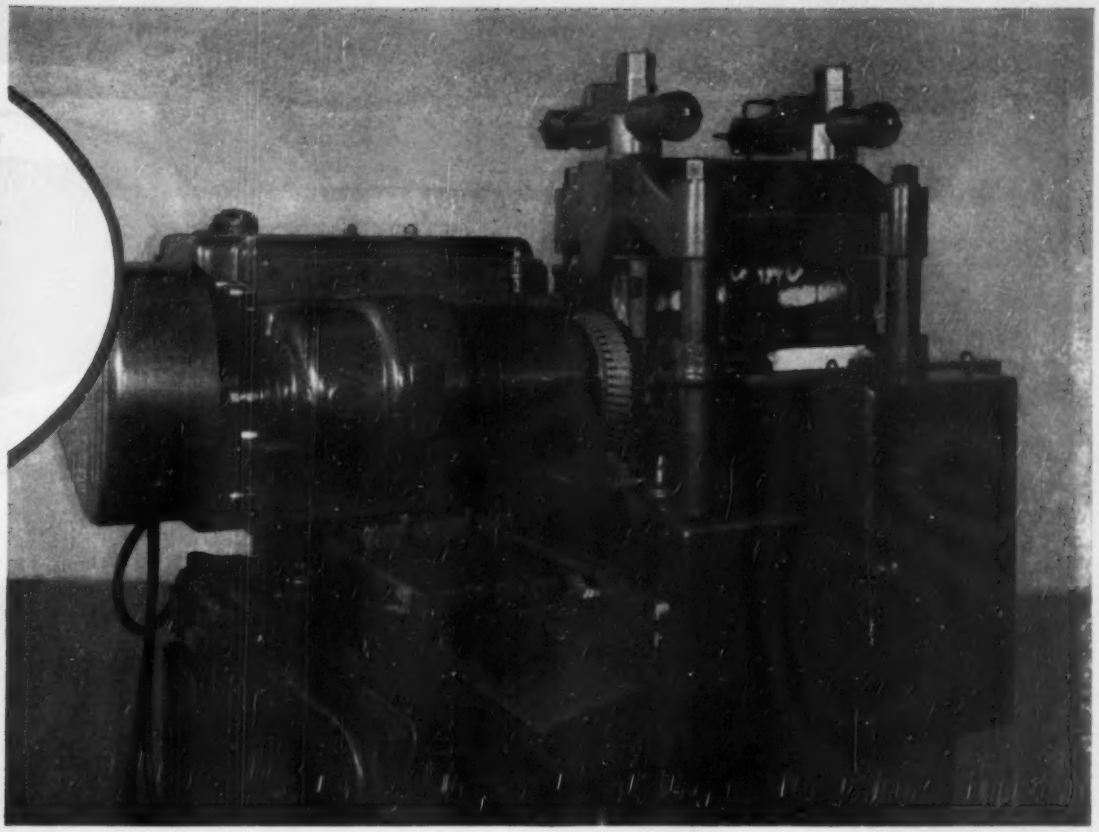
1—Plain Hydromatic (No. 5-60 size) Catalog No. M-1670

2—Duplex Hydromatic (No. 4-48 size) Catalog No. M-1670

3—Plain Tracer Controlled Hydromatic (No. 4-48 size) Catalog No. M-1602

4—Duplex Tracer Controlled Hydromatic (No. 56-90 size) Catalog No. M-1602

CINCIN



Unorthodox procedures sometimes work out to advantage. In this example, the work and cutter spindle head have been interchanged for an accurate milling operation on cylinder blocks. A lower unit cost resulted, and here are the reasons why. ¶ The machine, basically a CINCINNATI No. 3-24 Hydromatic Miller, is equipped with a spindle carrier mounted on the table, and a "dummy" headstock which incorporates a conveyor height fixture. The spindle carrier may look familiar to you . . . with minor alterations, it's the standard vertical head of a CINCINNATI No. 3 Vertical High Power Dial Type. To reduce physical effort for the operator, the fixture is pneumatically operated. A 12" diameter sintered carbide cutter takes the cut at 25" per minute. ¶ As you might suspect, this adaptation is the work of Cincinnati Application Engineers. These men are expert at taking standard units of CINCINNATI Milling Machines and putting them together with a minimum of special work to build up single purpose equipment to meet your requirements. Whether it's a tailor-made machine or merely a special unit, you can be sure of justifying your replacement policy with CINCINNATI handling your milling problems. May we hear from you? Write to Department E. S.

4

THE CINCINNATI MILLING MACHINE CO.
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NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
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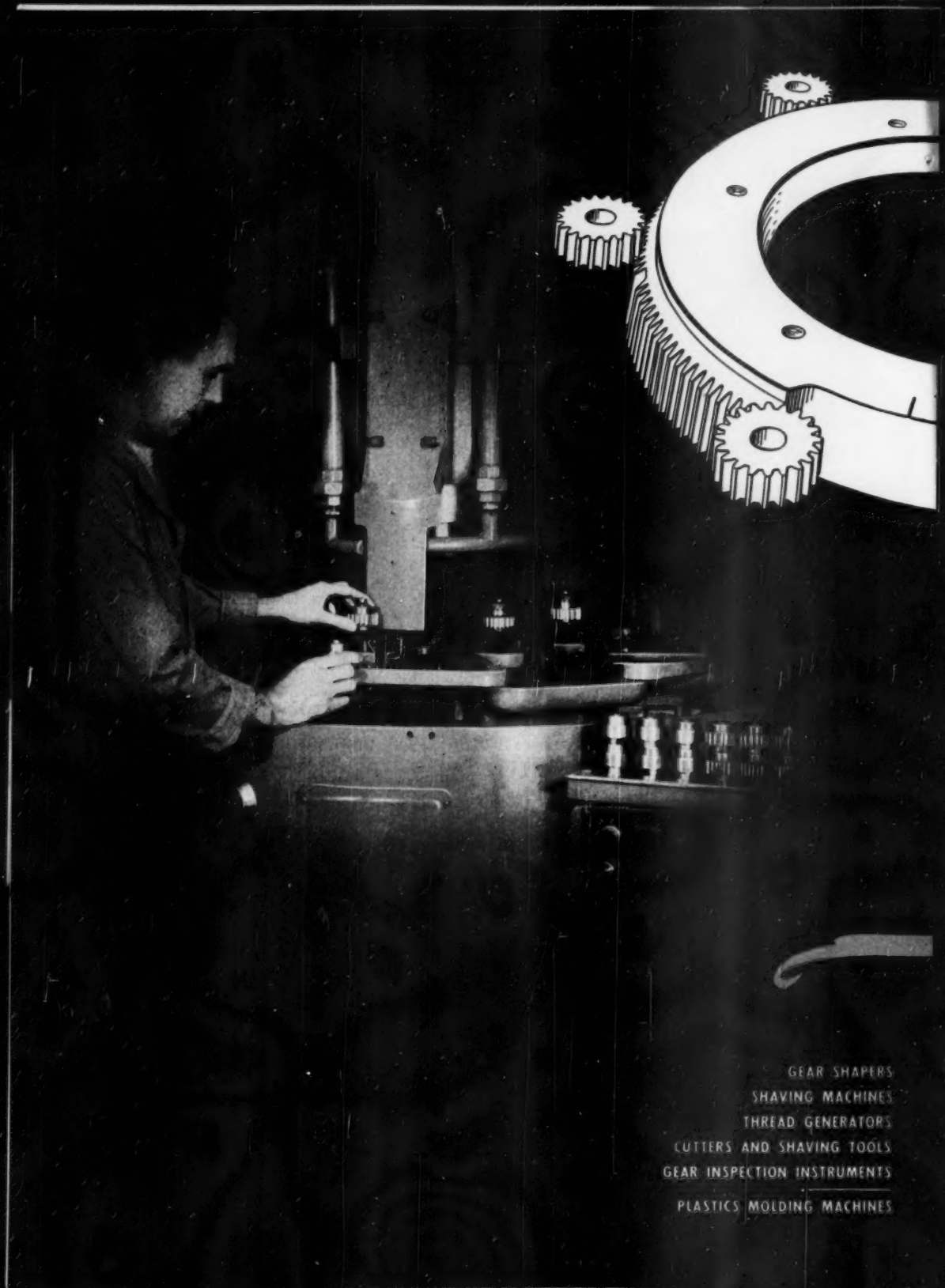
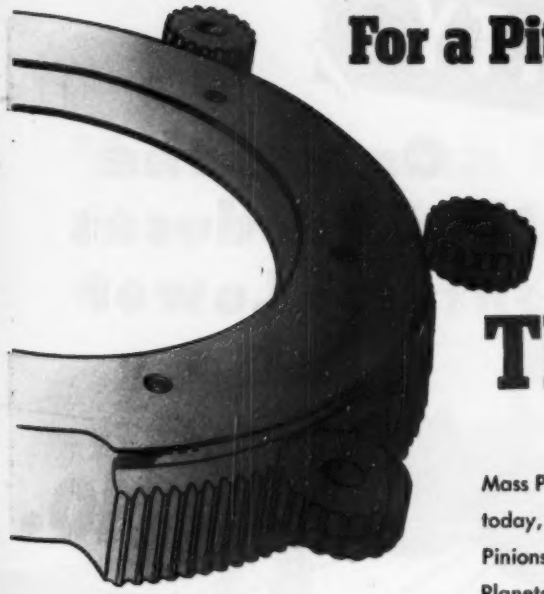
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES



For a Pitch Dia. to 3.375 in.*

Costs and Speed Commend

The Planetary

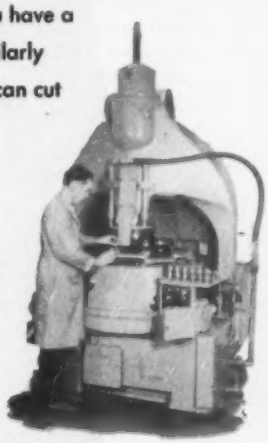
1 One big 17" cutter reciprocates continuously...

2 Work on 6 spindles are roughed and finish-cut, while revolving continuously around the cutter...

3 A gap provides for loading and unloading without stopping the machine

4 Fast roughing, fine finishing; easy cutter sharpening, are outstanding advantages

Mass Production gear cutting *where quality counts* is a job today, for a heavy-duty, Planetary principle Gear Shaper. Pinions and small diameter gears belong on the Fellows Planetary—with 6 busy work-spindles planeting around while the big non-rotating cutter reciprocates at high speed. The machine is built heavy and rigid, for maximum stock removal without loss of accuracy...on the 10 pitch, 20 tooth, cold-rolled-steel pinions pictured, cutter speed is 400 strokes per min., for 3/16" face width teeth—with a floor-to-floor output of *120 pieces per hour*. If you have a high-production requirement on similarly small gears, perhaps the Planetary can cut your costs way down, too. For consultation, or literature, call on the nearest Fellows office.



*Maximum pitch diameter of work is governed by several factors, such as: pitch, material and helix angle. For more complete information, submit your problems to our Engineering Department.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont,
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1.

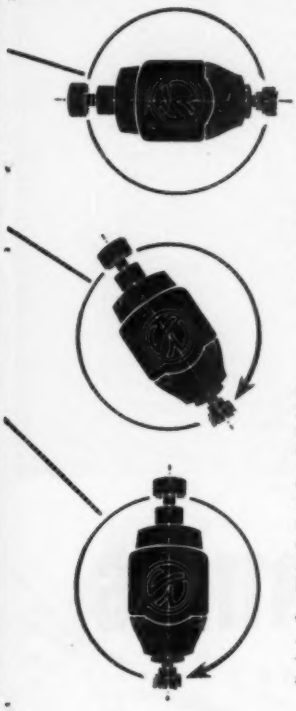
VERSATILITY

One of the that Produces at Lower

VAN NORMAN

Van Norman Features More Profitable Milling Costs with the

22L Ram Type Miller



The versatility of the Van Norman No. 22L miller enables it to meet the daily fluctuating milling requirements in all types of plant work. It minimizes idle machine time, reduces work re-setups, provides more profitable milling at lower costs.

Here's how — the adjustable cutterhead permits horizontal, angular and vertical milling on one miller. Because setups are minimized, errors that often occur when workpiece is changed are eliminated. Overall milling machine capacity . . . vertical to horizontal . . . is always at peak efficiency.

In addition, front and rear directional controls provide ease of operation . . . reduce operator fatigue . . . increase efficiency. Conveniently located speed and feed selectors permit quick selection of proper speed and feed. Rugged construction throughout assures long operating life. Investigate the Van Norman No. 22L Ram Type Miller for your plant. Write for bulletin.

Important Van Norman Features

• VERSATILITY
Rugged adjustable cutterhead permits horizontal, vertical or angular milling . . . all on ONE machine . . . with standard tooling.

• EASE OF OPERATION
Finger-tip front and rear control of all power feeds. . . . Front and rear 6-way rapid traverse. . . . Large easy-to-read graduated dials. Aluminum alloy arbor supports for easy handling.

• SIMPLICITY OF CONTROL
All power feed controls are DIRECTIONAL — operate in direction of desired table, saddle and knee movement. . . . Rotary-type feed selector. . . . Convenient and accessible speed selector.

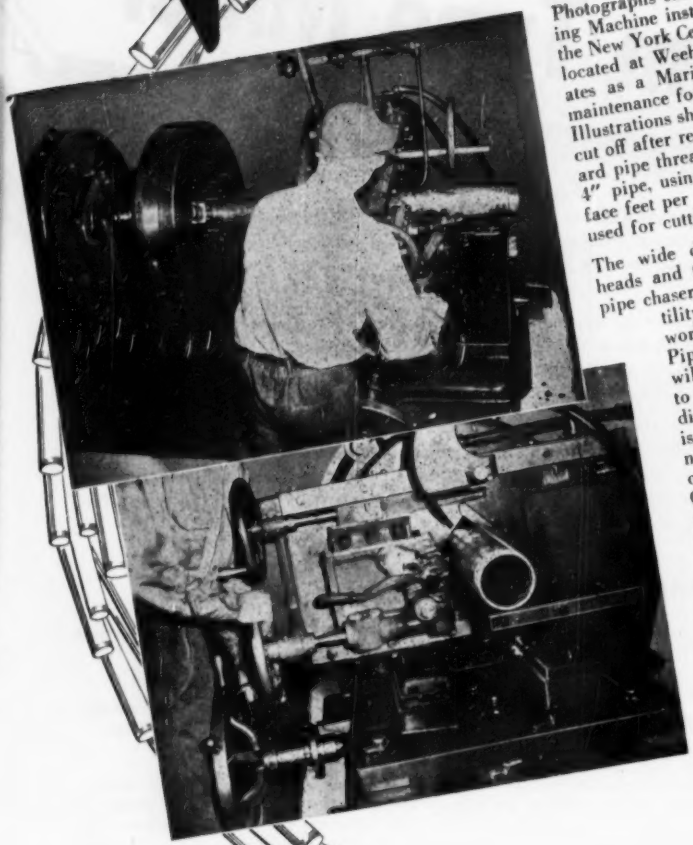
• INCREASED RANGE
Ram adjustment, in and out over column, provides added work range and capacity.

• RIGIDITY AND POWER
Spindle transmission gears are made of hardened alloy steel. . . . Lapped to assure smooth precision operation. . . . Multi-spline shafts operate on taper roller bearings. . . . Rugged column and base. . . . Massive knee.

• LONG LIFE
Precision built. . . . Automatic lubrication.

COMPANY, SPRINGFIELD 7, MASS.

Versatility



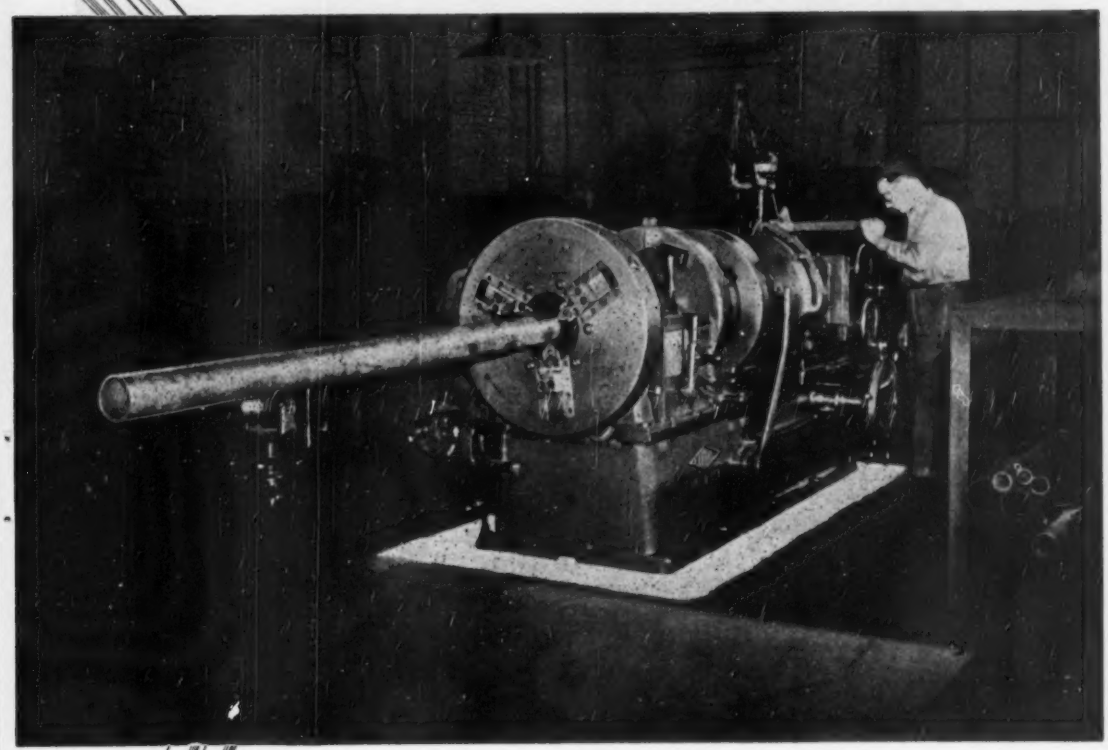
Photographs show a Landis Pipe Threading Machine installation in a Job Shop of the New York Central Railroad. This shop, located at Weehawken, New Jersey, operates as a Marine Repair Shop handling maintenance for tugs, barges, lighters, etc. Illustrations show wrought iron pipe being cut off after reaming and threading. Standard pipe threads are cut 1½" long on the 4" pipe, using a cutting speed of 25 surface feet per minute. This machine is also used for cutting boiler tubes to length.

The wide diametrical range of the die heads and the use of patented tangential pipe chasers gives these machines a versatility invaluable in maintenance work. For example, the 6" Landis Pipe Threading Machine illustrated will thread all pipe sizes from 1" to 6", inclusive. Adjustment of the die head from one size to another is simple and quick. Chasers need not be changed except for threads of a different pitch, form, or taper. Chasers are interchangeable and need only be replaced singly as needed. Tangential cutting action reduces wear, and chasers can be reground to use over 80% of their length. Thus, these machines feature—wide capacity; minimum set-up; longer running time; low tool cost, replacement, and inventory—important cost saving features for maintenance shops. For specifications and further information, write for Bulletin C-61.

LANDIS

WORLD'S LARGEST

SAVES TIME AND MONEY IN MAINTENANCE SHOPS



Machine COMPANY WAYNESBORO PENNA., U.S.A.

EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

10" x 30" Type CH-IW for precision infeed grinding of concentric diameters in one operation—straight, tapered, profiled. Write for bulletin CP48.

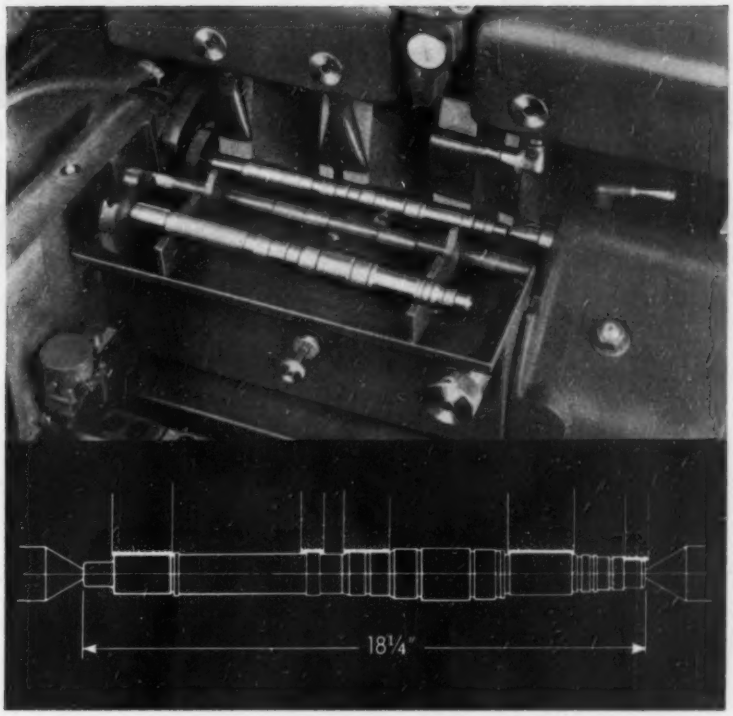
Multiple Wheel Grinder

LANDIS TOOL
Precision Grinders

If you submit blueprints of your work pieces, our engineers will make production estimates and tooling suggestions without obligation.

EQUIPPED WITH MICROSPHERE BEARINGS

Grinding 5 diameters in one operation.



Reduces Precision Grinding Costs

by eliminating extra grinding operations

How you can save!

LESS **INVESTMENT** One IW replaces two or more conventional cylindrical types.

LESS **MAN HOURS** Any number of different concentric diameters ground in one operation with semi-automatic cycle.

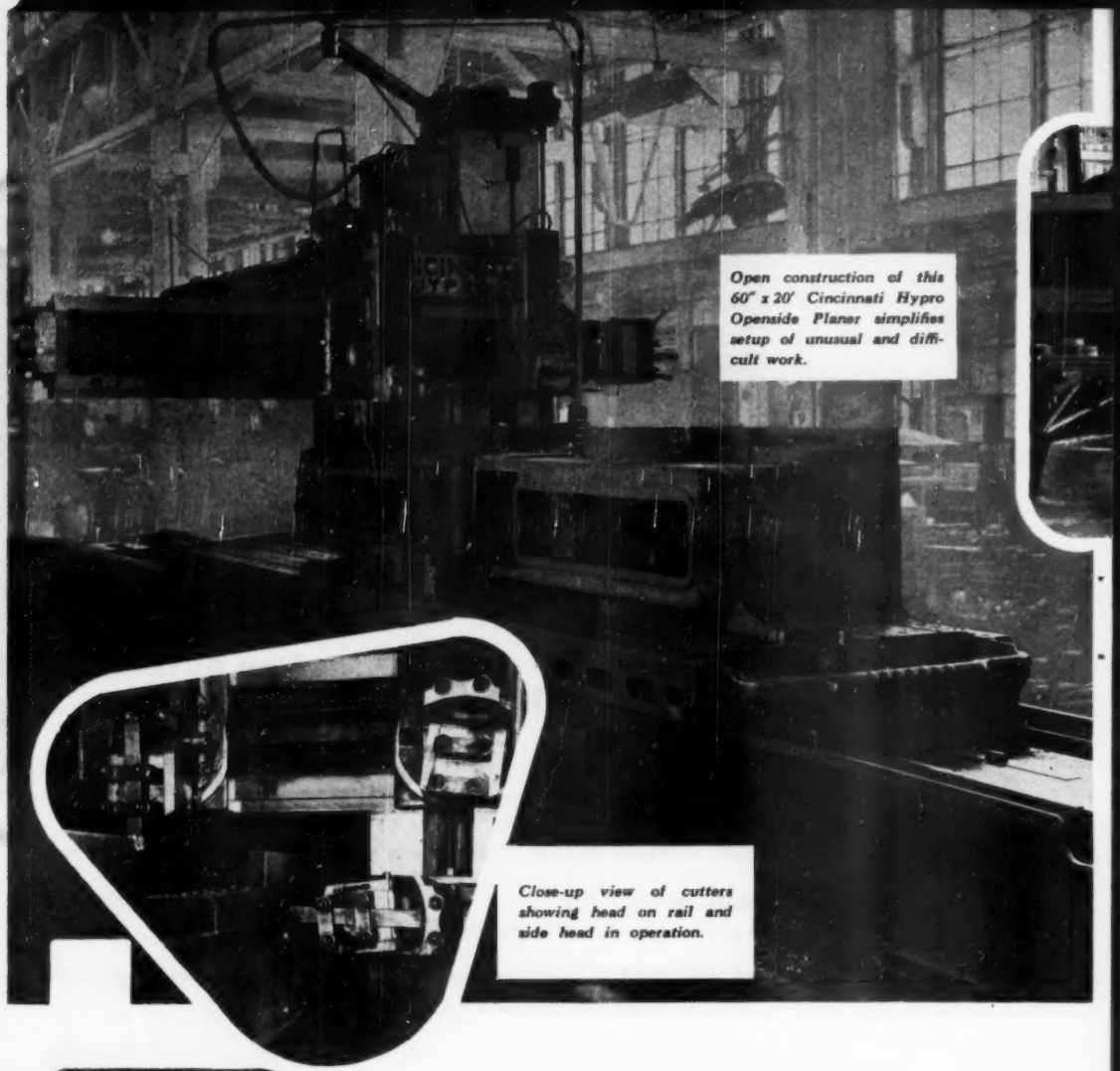
LESS **SETUP TIME** A single setup on the IW instead of two or more setups on the machines which the IW replaces.

LESS **WORK HANDLING** Only one loading and unloading operation. No moving work from one machine to another.

LANDIS TOOL COMPANY WAYNESBORO, PENNA., U.S.A.

this Modern

CINCINNATI Hypro OPENSIDE PLANER . . .



Open construction of this 60" x 20' Cincinnati Hypro Openside Planer simplifies setup of unusual and difficult work.

Close-up view of cutters showing head on rail and side head in operation.

HYPRO

THE CINCINNATI

Subsidiary of Giddings & Lewis Machine

....easily

meets unusual production demands
lowers unit cost
• • • • • •
improves work quality
speeds part output

The two heads on the rail and side head may be used singly or simultaneously. Note convenient pendent control.

Ample Table Size Simplifies Work Setup - Rail and Side Head Cutters Remove Metal Quickly and Accurately.

Overall production time on these 4700 pound Meehanite lathe end frames is materially reduced by planing with a Cincinnati Hypro Openside Planer. This modern machine tool has ample capacity to mount end frames in tandem which not only improves work quality but also speeds part output. Parallelism and flatness of planed surfaces is held to ± .001". Machining time using one rail head and one side head is 9 hours for the two castings which require 5 setups. Floor-to-floor time on the job is 14 hours which is a considerable reduction over the time formerly taken to plane the end frames.

This modern Cincinnati Hypro Openside Planer may easily solve numerous machining problems in your plant and also help you to meet unusual and urgent production demands. Ask experienced Cincinnati Planer Co. engineers for their recommendations with no obligation.

Other Profit Producing Cincinnati HYPRO *Machines*

- Double Housing Planers
- Planer Type Milling Machines
- Frog and Switch Planers
- Vertical Turning and Boring Mills
- Special Planers and Boring Mills

PLANER COMPANY

Tool Company, FOND DU LAC, WISCONSIN, U.S.A.

High Power, High Speed, High Efficiency combined in LINK-BELT SILENT CHAIN DRIVES

RUGGED

Link-Belt Silverstreak silent chain drives combine ability to carry heavy overloads with the resilience that sustains and absorbs shock.

DEPENDABLE

Silverstreak silent chain drives cost practically nothing for upkeep—run 10, 20, or more years without attention beyond occasional oiling.

COMPACT

Operating efficiently on short centers, they save valuable space. Ratios as high as 10 to 1 are commonly used.

EFFICIENT

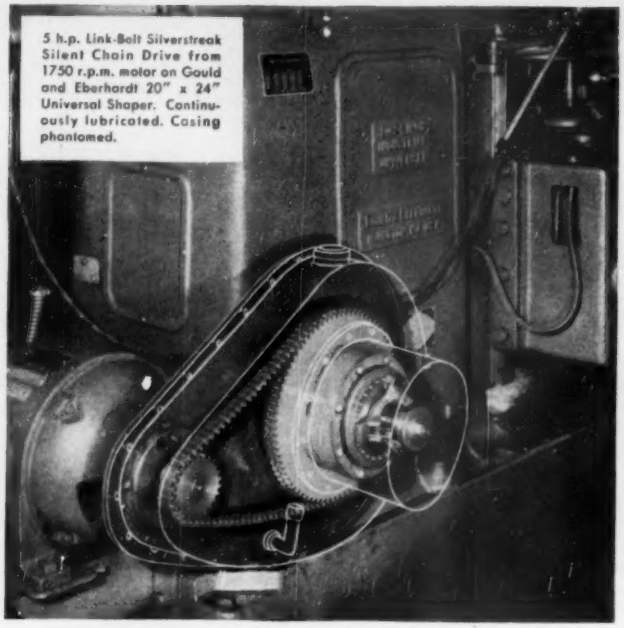
98.2% efficiency maintained throughout the life of the drive.

POSITIVE

As the chain, in the form of a flexible rack, meshes with the teeth of the sprocket, the drive cannot slip.

PRE-SELECTED STOCK DRIVES

Chains and sprockets for drives from ½ to 50 h.p. are available from stock at Link-Belt distributors and factory branch stores in all principal cities.



5 h.p. Link-Belt Silverstreak Silent Chain Drive from 1750 r.p.m. motor on Gould and Eberhardt 20" x 24" Universal Shaper. Continuously lubricated. Casing phantomed.

Link-Belt Silverstreak silent chain is the most efficient and durable medium for the transmission of power at high speeds. Entirely constructed of steel, and enclosed in an oil-tight casing, it will give dependable service with sustained efficiency for long periods. Link-Belt Silverstreak silent chain drives are outstanding where efficiency, wide adaptability and low over-all costs are important. Tested by years of service, they are the most modern type you can use.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities. 12,044-B

LINK-BELT Silverstreak SILENT CHAIN DRIVES

Are you buying machine tools for a competitor?

WHEN ANY COMPANY buys *new* machine tools to replace *old* ones, it doesn't do so just to spend money. You can be sure its management has carefully figured out that these new machines are going to pay for themselves—and usually in short order.

They have satisfied themselves that they will get increased production—that this increased production will cut costs—and they expect to use these lower costs to get more business for themselves.

TAKE EXAMPLES SUCH AS THESE:

COMPANY A, replaced 3 old machines with 2 new Warner & Swasey Turret Lathes and cut machine time 27%.

COMPANY B bought a new Warner & Swasey No. 5 Spindle Automatic to turn an important precision job being done on old machines. *Result:* Production increased 5 to 10 times, labor costs reduced 93%. Capital investment reduced 66%. Power costs reduced 70%.

COMPANY C installed a new Warner & Swasey 1-AC Single Spindle Automatic and produced as many pieces in a single hour as had formerly been produced in 6 hours on an old single spindle machine.

COMPANY D bought a new Warner & Swasey 5-Spindle Automatic, saving 50% on operators and setup man's time, besides thousands of dollars in cutting tool reconditioning and replacement by elimination of secondary operations.

If any of those companies are among your competitors, bidding against you for machining work or selling a similar product, unless you, too, are using up-to-date machines, they can undersell you.

Their increased business will be at your expense. *Then it is actually you who are paying for the new tools bought by your competitor.*

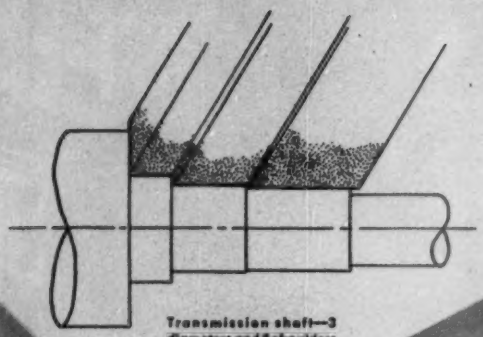
WARNER & SWASEY SELLS ONE THING . . . INCREASED PRODUCTION

WARNER & SWASEY Machine Tools *Cleveland*

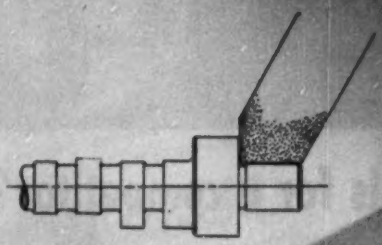
TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

NORTON *ANGULAR* WHEEL SLIDE GRINDERS

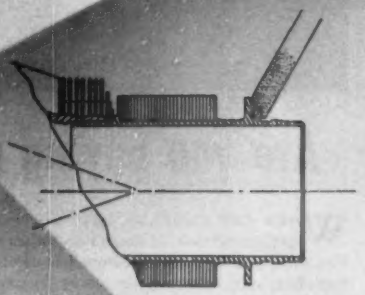
For grinding one (or more) diameters and adjacent shoulders



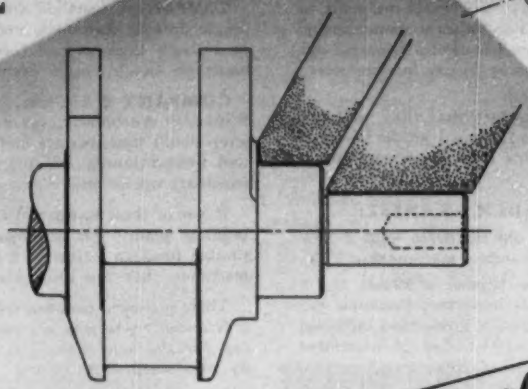
Transmission shaft—3 diameters and 3 shoulders



Camshaft—gear fit and thrust shoulder



Aircraft engine cylinder —flange seat and fit diameter

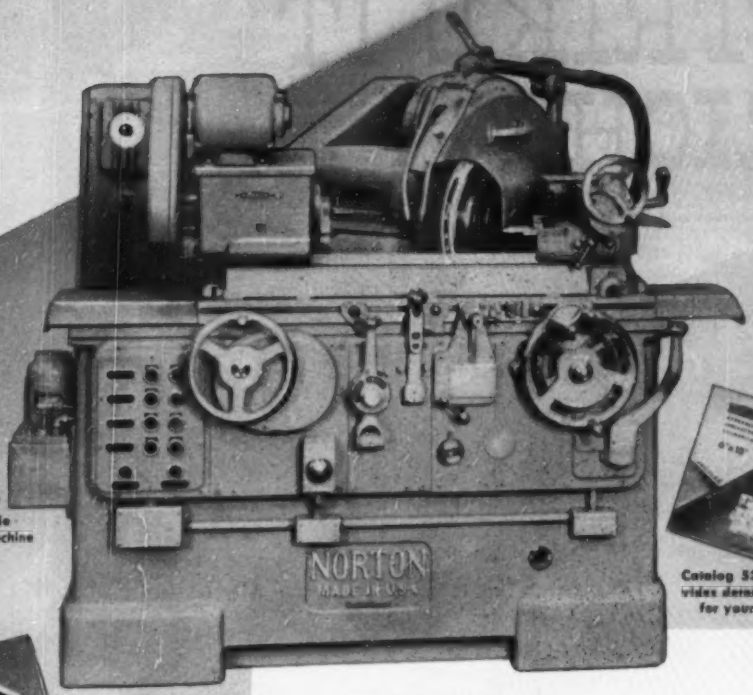


Crankshaft—end main bearing and shoulder and gear fit diameter

Planned replacement pays dividends

making better products to make other products better

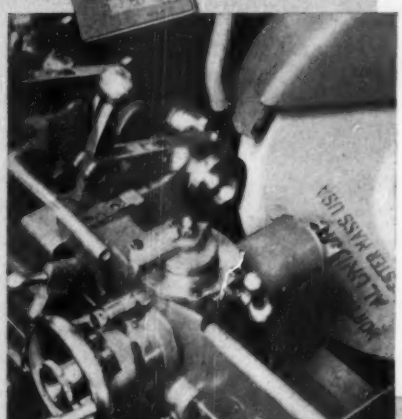
Save 3 Ways..in Time..in Effort..in Space!



NORTON 6 x 18" Angular Wheelslide Semiautomatic Machine

Catalog 533-1 provides details. Write for your copy.

Catalog 1793-1 provides details. Write for your copy.



Norton 10 x 36" Angular Wheelslide Semiautomatic Machine grinding crankshaft flange face and two diameters

A THREE-WAY saving in time, labor and floor space is possible for your plant with the Norton Angular Wheelslide Machines. The 6 x 18" and the 10 x 36" Angular Wheelslide Semiautomatic Machines have a 30° feeding action to permit grinding both shoulders and diameter simultaneously with a single automatic feed cycle. This eliminates one handling plus the labor of shoulder bumping which is required by conventional two-operation methods. If you have such grinding operations in your plant, it will pay you to study the performance records of these Norton Grinders. A Norton Engineer will be glad to help you with your grinding problems. Please address your request to: Machine Division, Norton Company, Worcester 6, Mass.

M-390

NORTON

NORTON COMPANY, WORCESTER 6, MASS.

You'll "STRIKE IT RICH", too

. . . if you can unearth a New Sales-Building "COUNT-Ability" in your product!

It adds up as simply as 1-2-3, like this:

1: Take a new, objective look at your product . . . with a sharp "mathematical eye" . . . to see whether it could do more for your customers *if it could count.*

2: If you see the glimmer of a hidden Count-ability, call in a Veeder-Root engineer.

3: If he agrees that you've "got something" . . . and develops it into a new sales-promotion feature, then . . .

TO SUM UP, you build a Veeder-Root Counter into your product as an integral part . . . and proceed to bring in a "gusher" of new orders. Now, let's see if we can strike oil for *you!*

MEDIUM SIZE COUNTER (shown) counts strokes and turns, is *built into* scores of products from oil-well depth measures to tabulating machines and turnstiles. One of hundreds of V-R Counters, basic types of which are shown in FREE 8-PAGE BOOK. SEND FOR YOUR COPY TODAY.

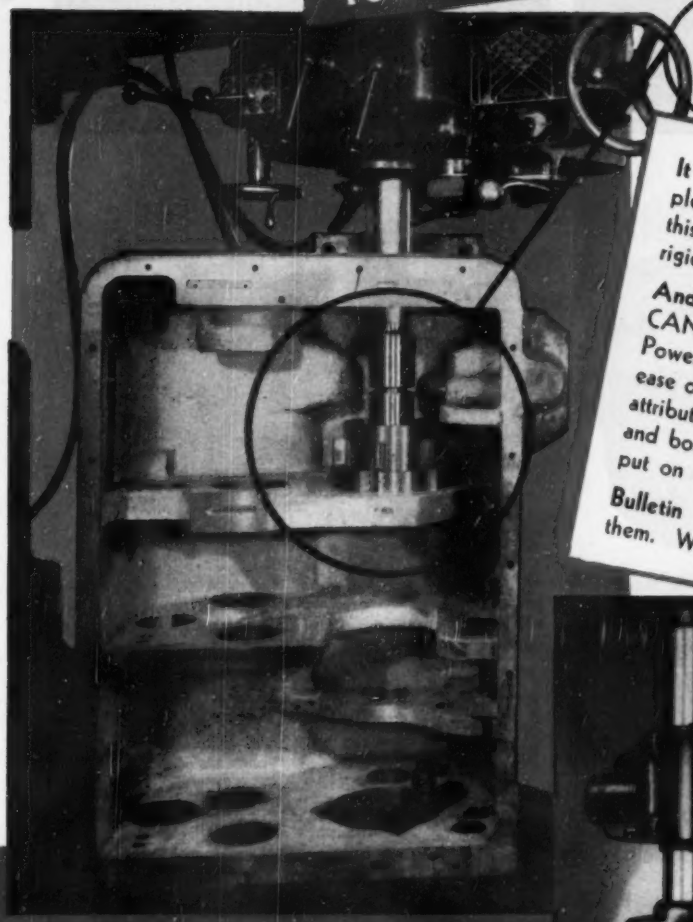
Veeder-Root COUNTERS "Count Anything on Earth"

VEEDER-ROOT INC., HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3
In Great Britain: Veeder-Root Ltd., Kilspindie Rd., Dundee, Scotland

A GOOD SPINDLE

FOR GOOD BORING AND TAPPING . . .

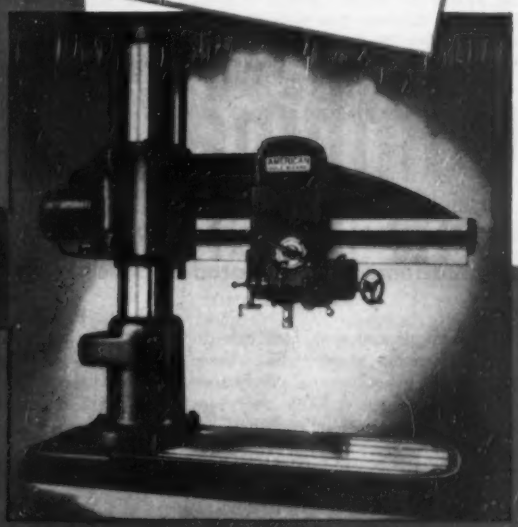


Here's a 10" tapping job on a 5-foot "AMERICAN" Hole Wizard Radial

It takes a sturdy, rigid machine with plenty of power to do work like this. Especially does it require a rigid and smooth-acting spindle.

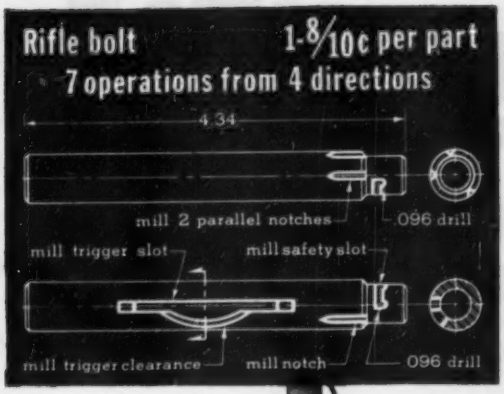
And that's exactly what "AMERICAN" Hole Wizards are noted for. Power—rigidity—convenience and ease of control are "AMERICAN" attributes that cut drilling, tapping and boring costs wherever they are put on the job.

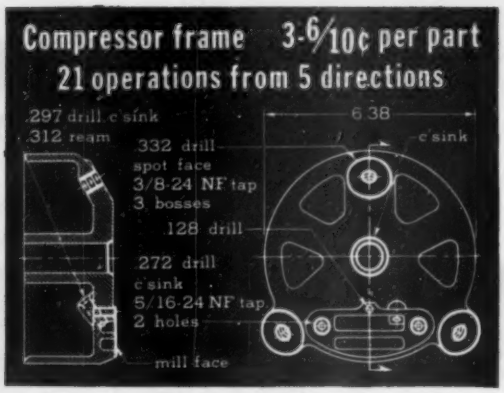
Bulletin No. 327 tells all about them. Want one?

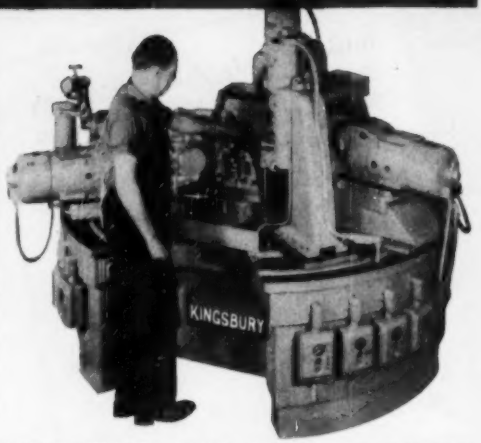


THE AMERICAN TOOL WORKS CO. Cincinnati, Ohio U.S.A.

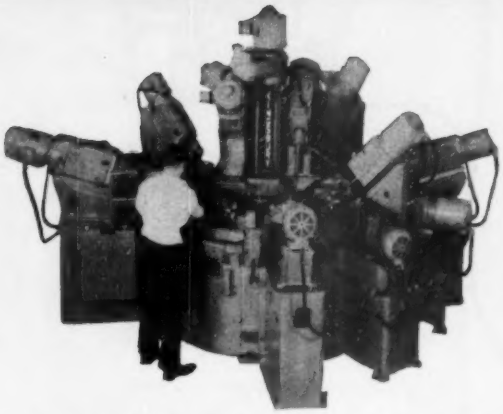
Lathes and Radial Drills







295 PARTS AN HOUR GROSS. A 20-inch power index table has seven fixtures. Two horizontal units off the radial lines drill the holes. Three radial horizontal units mill the slots and trigger clearance. Two vertical units mill the three notches.



390 PARTS AN HOUR GROSS. A 60-inch power index table has eight fixtures. At three stations nine units operate on three bosses. At four stations nine tools work from the front and units on the central column do the angular hole from the rear.

Combined operations cut

Single-purpose drilling and tapping machines, built to each customer's needs, produce much more per man-hour

Dear Sir:

General-purpose machines can do the operations above. But these Kingsburys do them much cheaper and much faster. A Kingsbury does thousands of operations each hour — all automatically. One operator loads and unloads the parts.

Units perform the operations

A suitable drilling or tapping unit does each operation. If necessary we add a milling attachment or multi-spindle auxiliary head. Each unit is automatic and has its own motor (1/3 to 5 hp). Units can be horizontal, vertical or at angles. (By the way, all 16 units for the compressor frame are at angles.) In one chucking of a part, a Kingsbury can do a variety of operations from many directions.

Uniform, accurate machining

Machining is uniform. Each unit has an automatic cycle and cam feed that do not vary. All fixtures on any one machine are interchangeable. Each machine does many operations on the part while it stays in its fixture and no one touches it.

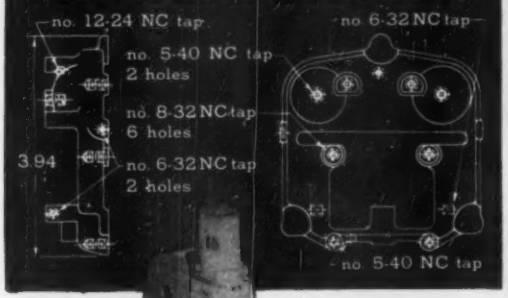
Tools work to close tolerances. Bushings guide drills and reamers. The bushings are in the fixtures or in plates that pilot to the fixtures.

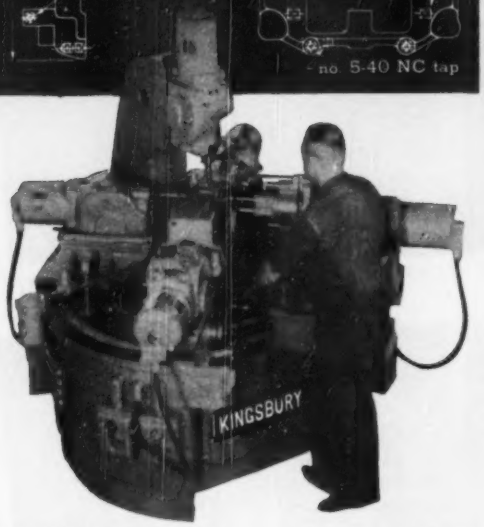
You are the boss

You name the output rate and the operations and approve the sequence. You approve our fixture design before we start engineering. You approve samples before we ship the machine.

Our key men take a real interest in your machine. They know it by name. If someone mentions an order number they ask, "Whose machine is that?" They attend to your requests on safety features, electrical equipment, tool holders, guide bushings, paint, etc. Even the president and vice-president

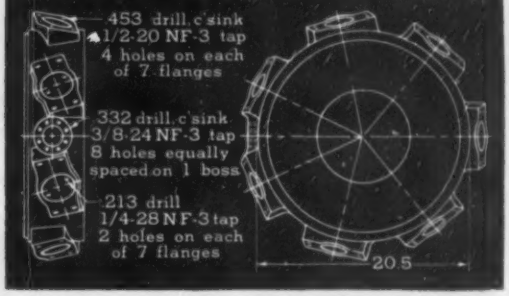
Meter frame **1.0¢ per part**
13 operations from 5 directions





360 PARTS AN HOUR GROSS. One vertical and four horizontal units tap five sides of the same part at the same time. There is no indexing. Three units have multi-spindle auxiliary heads. Two Kingsburys ahead of this setup drill these and other holes.

Airplane engine part **32¢ per part**
136 operations from 8 directions



21 PARTS AN HOUR GROSS. One part at a time indexes on its axis, 1/7 turn per index. Three angular units drill the flanges after indexes 1 to 7, countersink after 2 to 8 and tap after 3 to 9. Three horizontal units do the eight holes after indexes 1 to 3.

cost and increase output

spend most of their time on proposals and machines for our customers.

The crucial moment

Your Kingsbury arrives. (Ten to one it's on time.) You remove the skids and rust-proofing, level it, connect the power and air lines, run off samples and inspect them. You call the front office. "That new Kingsbury is in production. Do you want to see it?" It is as simple as that.

That is one reason why plants keep on buying Kingsburys. Since the last war ten plants have paid us $4,072,690 for new equipment, none of these ten under $200,000. (Don't let this scare you. Some plants may require only *one* Kingsbury.)

Can we save you money?

It costs nothing but a little time and a stamp to get a firm proposal. Just send a print to our Mr. L. A. Carll. Tell him the operations and hourly output you need. Or ask him for free bulletins showing 53 setups.

Sincerely,
Kingsbury Machine Tool Corp.
120 Laurel Street, Keene, N. H.

About the costs on the drawings

Each unit cost includes the man and machine on all operations shown – no power or overhead. We assumed three things: 1) 80% efficiency, 2) Each man's wage rate would equal the national average for such work, 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life.

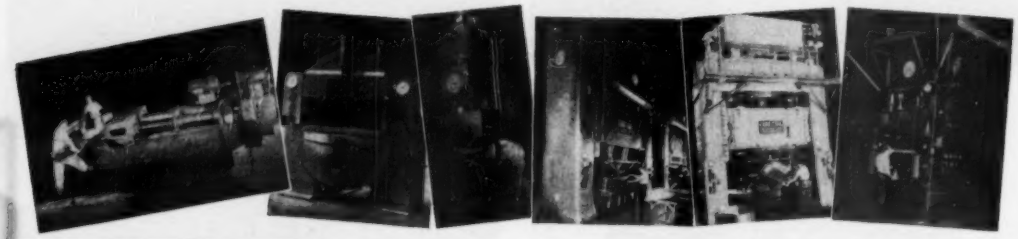
KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

We do it for OTHERS

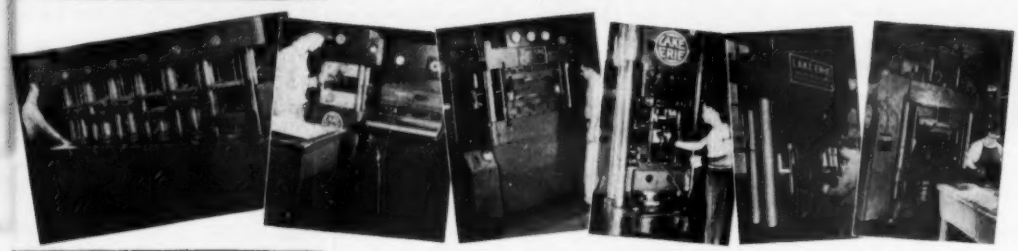
We have developed more than 3,500 *different designs* of hydraulic presses of *all types* to cut costs, simplify manufacture, improve quality and increase production for others.

FORMING • EMBOSSING • COINING

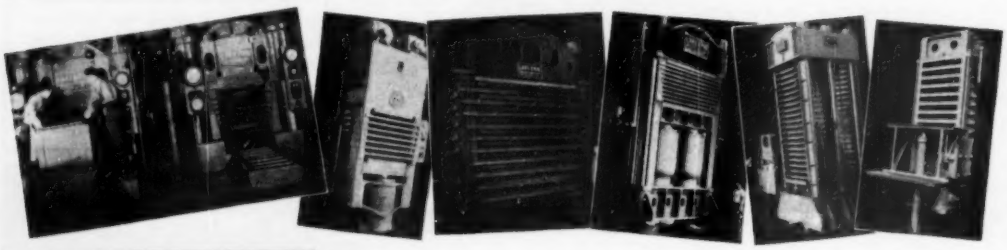


METAL WORKING DRAWING • BENDING • FORCING

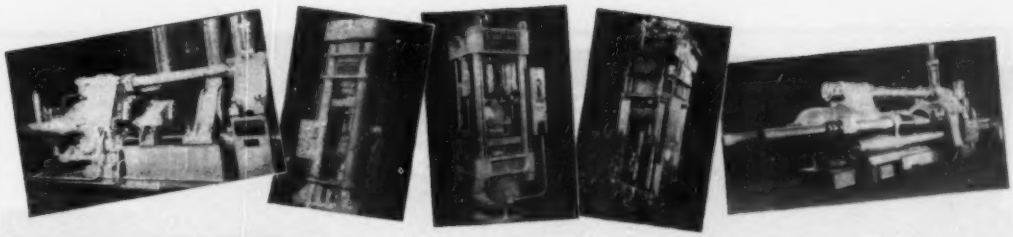
METAL WORKING FORGING • HOBBING • FLANGING



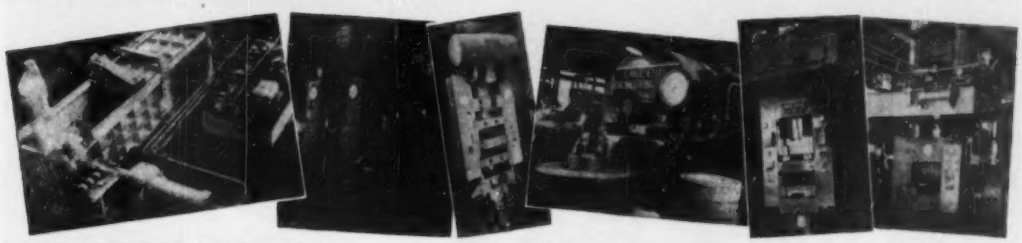
PLASTIC MOLDING COMPRESSION • TRANSFER • LABORATORY



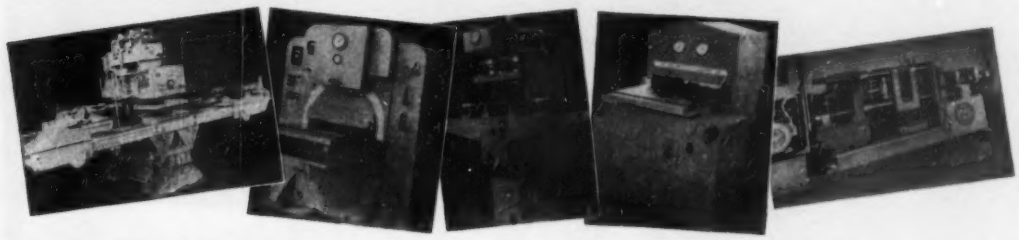
WOOD & PLASTIC PANELS HARDBOARD • WALLBOARD • PLYWOOD • LAMINATES



EXTRUSION PRESSES LEAD • CARBON • NON-FERROUS METAL



BRIQUETTING & BALING METAL POWDER • CARBON • REFRACTORY • GRINDING WHEEL • SCRAP



MISCELLANEOUS STRAIGHTENING • DIE CASTING • BELT • STEREOTYPE MOLDING

We can do it for YOU!

With the broadest line of equipment in the entire industry, we can supply hydraulic presses for every application that are *guaranteed to lower your costs* and improve your production. A recommendation will cost you nothing. Write or phone us.

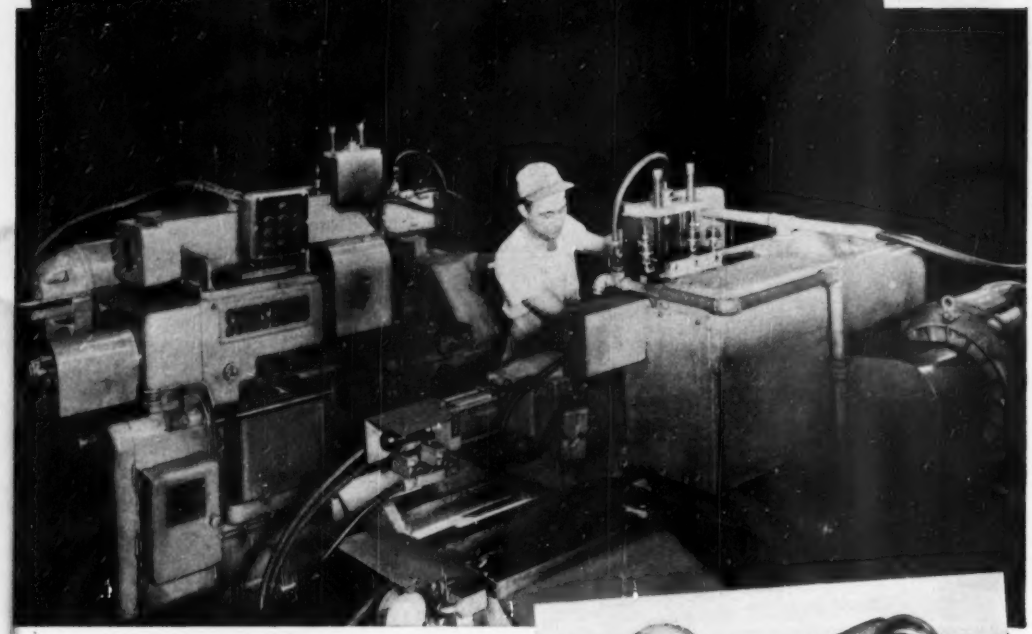
LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE ®

LAKE ERIE ENGINEERING CORP.
MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY
General Offices and Plant:
507 Woodward Avenue Buffalo 17, New York
DISTRICT OFFICES IN NEW YORK, CHICAGO and DETROIT
Representatives in Other Principal Cities in the United States and Foreign Countries
Manufactured in Canada by: Canada Iron Foundries Limited

Leading manufacturer of hydraulic presses—all sizes and types
Metal Working...Plastic Molding...Forging...Metal Extrusion...Processing...Rubber Vulcanizing...Stereotype Molding
Plywood...Wallboard...Briquetting...Baling...Special Purpose.

Production Increased From 40 to 132 Pump Bodies Per Hour



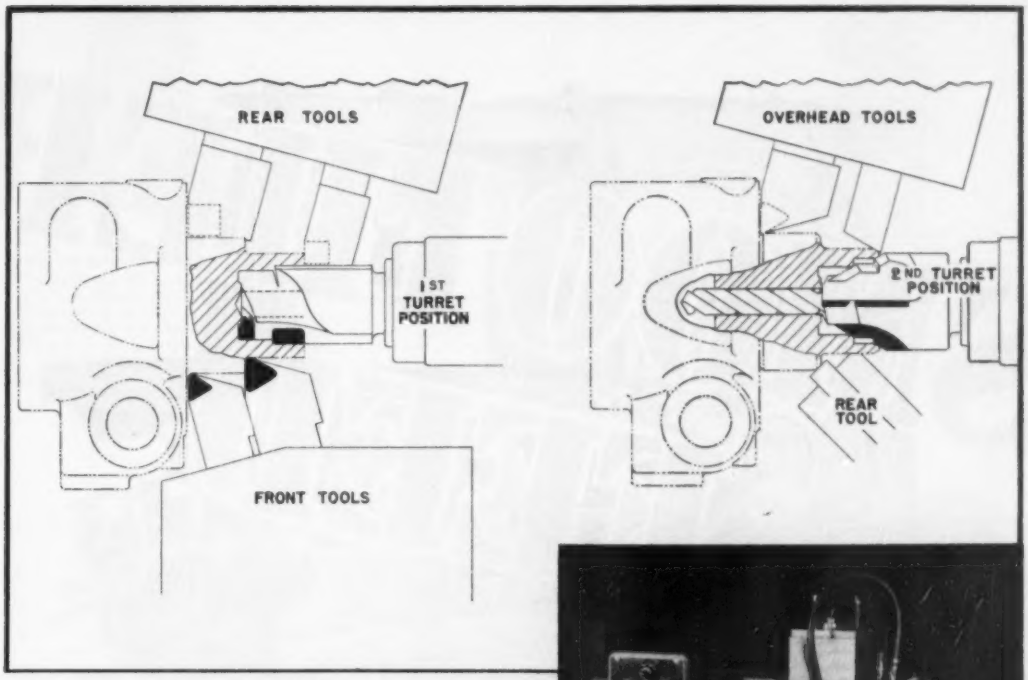
.....On SUNDSTRAND *Automatic Lathes Using Multiple Tooling and Automatic Cycling*

Pump body castings before (left) and after (right) turning operation on Sundstrand Model 8A Automatic Lathe.

Here's fast, profitable machining of a pump body part requiring turning, facing, chamfering, drilling, and counter-boring operations. All are performed on a Model 8A Sundstrand Automatic Lathe with multiple tooling and automatic cycling. Two of many features contribute to the efficiency of this installation. First, the machine is automatic and completes a rough and finish cycle once started by the operator. This enables one operator to run two machines and produce 132 bodies per hour instead of 40 per hour as obtained with the previous equipment and method. Second, indexing of the insert type tools is fast and accurate minimizing time out for changing tools. Other features of this and all Sundstrand Automatic Lathes include simplicity of setup and quick changeover which make it possible to turn both long and short run work profitably. It will pay you to investigate these features. Further, have Sundstrand engineers assist you with tooling recommendations. There is no obligation for this service.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

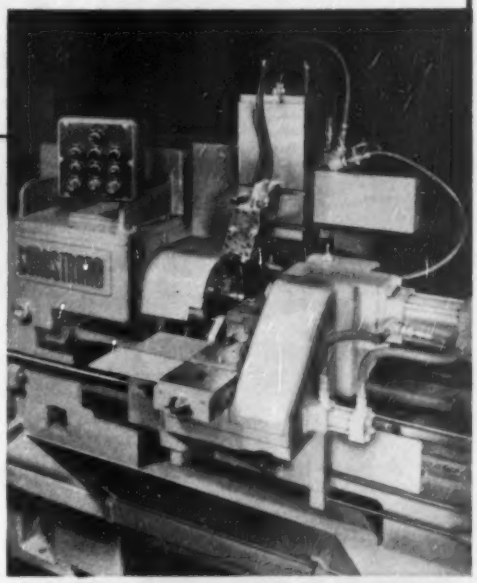
RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



Eleven Tools Work Automatically To Rough and Finish Critical Surfaces

The tooling diagram illustrates the number and type of tools used on this job. The illustration to the right shows the position of the overhead slide and turret. The machine cycles twice automatically with automatic indexing of turret to finishing position and automatic re-setting of front slide tools to depth for finish turning cut. Machine has two speed motor which automatically steps up to high speed for finishing cut.

If you have turning operations in your plant, it may pay you to consult a Sundstrand engineer. He may be able to combine operations for faster and more profitable machining.



FREE Additional Data

This new booklet will give you complete engineering data on the new Sundstrand Model 8A Automatic Lathe. Typical turning jobs and physical dimensions are included. Write for your copy today. Ask for Bulletin No. 199.

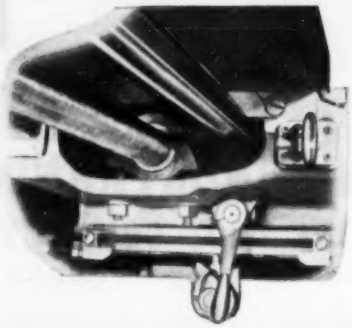
SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

SMOOTHER FEED

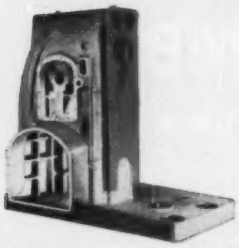
A new line of Knee-Type Milling Machines

KEARNEY & TRECKER MILWAUKEE **CK's**

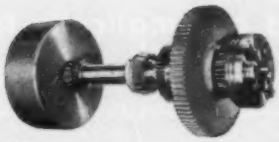


YOU'LL get the smoothest feed performance ever on Kearney & Trecker's new CK milling machines. Why? Because these CK's have a new design, heavy duty, 2" diam. table feed screw rotating through an extra-long table feed nut — giving you more bearing contact. That means smoother power feed. Add the positive-acting backlash eliminator and you get CK's smoother, more effective climb milling. What's more, the separate motor drive for table feed is interlocked with the spindle drive motor for overload protection. No danger of stalling cutters in cut. But smoother feed is only one of many pace-setting CK features. Look at all the others. You'll see why CK's are the most productive, profitable milling machines you can buy today — anywhere!

Replacement of obsolete machine tools is an



GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

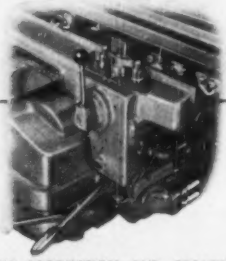


GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.

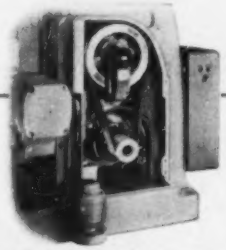
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

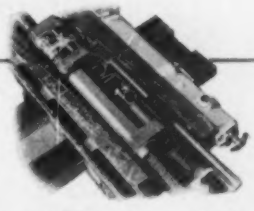
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from ½" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

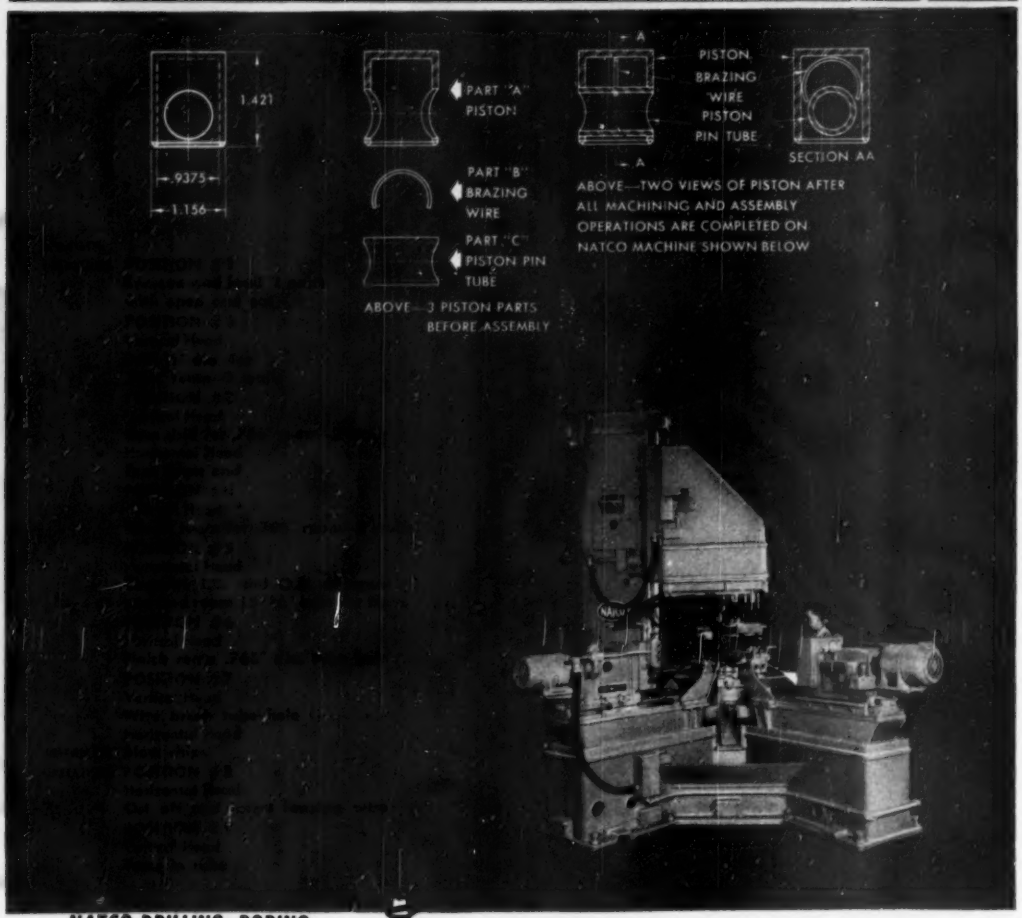
Kearney & Trecker's new CK line of knee-type machines is designed to meet every demand of present-day milling . . . making them more accurate, and MORE PRODUCTIVE for you. Contact your Kearney & Trecker representative or write direct to obtain their complete specifications. Find out how CK machines easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

investment that makes Dollars and Sense.

MACHINES AND ASSEMBLES

three parts automatically to complete

248 Refrigerator Pistons Per Hour



NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

NATCO

Call a Natco Field Engineer

This NATCO four-way vertical and horizontal drilling machine is just one of the many examples of the way NATCO contributes to higher production and lowered costs for industry. Send us your drilling, boring, tapping or facing problems . . . our engineers have the solution.

Write for NATCO "Success Story" No. 5
Dept. AM

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.
Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

Delta Solves Sequence Control Problem with Allen-Bradley Special Panel

This special drilling machine, made by Delta Manufacturing Division of Rockwell Manufacturing Company, requires precision automatic control.

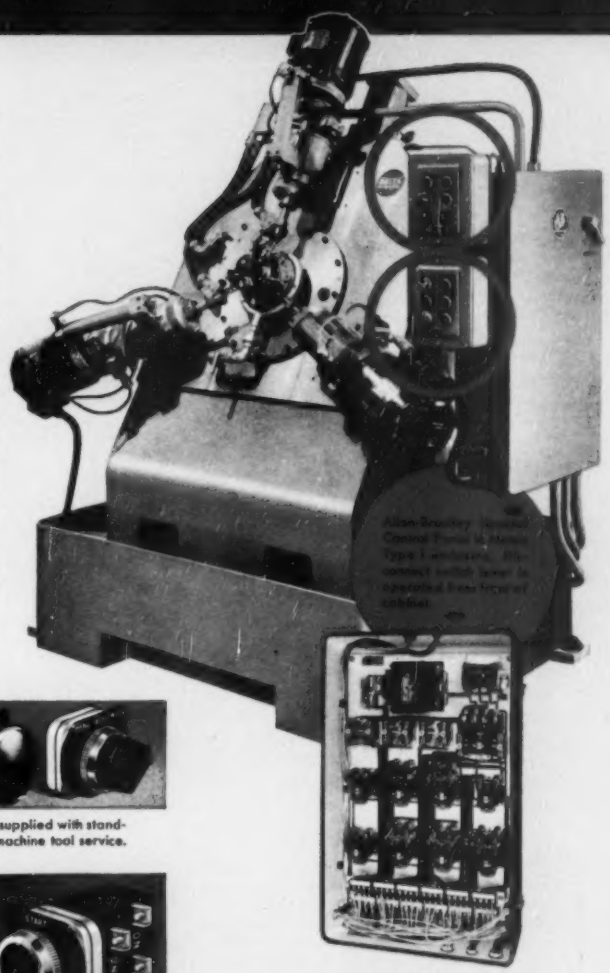
Delta designers adopted an 8-relay Allen-Bradley control panel with magnetic solenoid starter and manual disconnect unit for automatic sequence control.

For resetting the machine to handle a new drilling job, two Allen-Bradley oiltight push button stations with pilot lights are mounted within convenient reach of the operator.

The Bulletin 700 solenoid operated relays have established their reputation for amazing precision in closing and opening the circuit, as well as their complete dependability. These relays are good for millions of trouble free operations in any type of service.

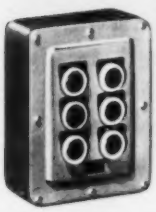
Leading machine tool builders are achieving more reliable machine performance with Allen-Bradley solenoid controls. Write for Bulletin 700 catalog, today.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

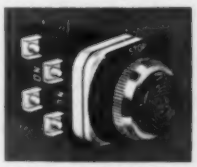


Control panel with cover removed to show arrangement of relays, magnetic switch, disconnect unit, control transformer, protective relays, and terminals.

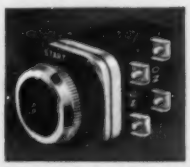
A few of the wide variety of "operators" which may be supplied with standard Allen-Bradley single or double contact blocks for machine tool service.



Bulletin 800T Oiltight Control Stations are available for surface or flush mounting with buttons, selector switches, pilot lights, and name plates to meet any need as shown above.



Oiltight "Stop" Button with 1 NO & 1 NC contact.



Oiltight "Start" Button with 2 NO & 2 NC contacts.

5508

ALLEN-BRADLEY
TROUBLE FREE MOTOR CONTROLS
QUALITY

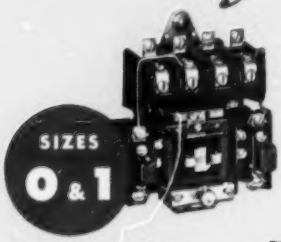
THE *Only* COMPLETE LINE OF SOLENOID STARTERS

Double break, silver alloy contacts

8 Sizes—up to 600 Hp, 440-600 Volts

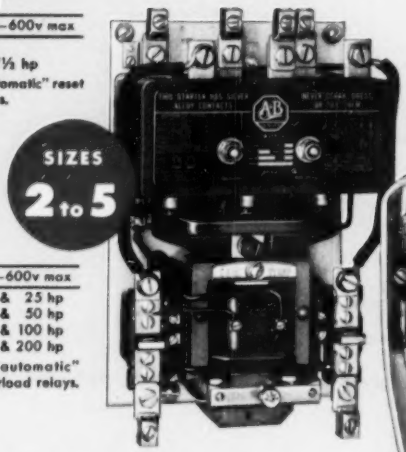
Allen-Bradley is the only control manufacturer who can supply a complete line of solenoid starters and switches from Size 0 to and including Size 7. That means from 15 amperes for Size 0 up to 900 amperes for Size 7.

Allen-Bradley solenoid starters are consistent and precise in operation. No other line is of such simple construction. That's why it pays to standardize on Allen-Bradley solenoid controls for your motor driven machines.



Size	220v—600v max
Size 0	2 hp
Size 1	5 & 7½ hp

"Hand" or "automatic" reset overload relays.

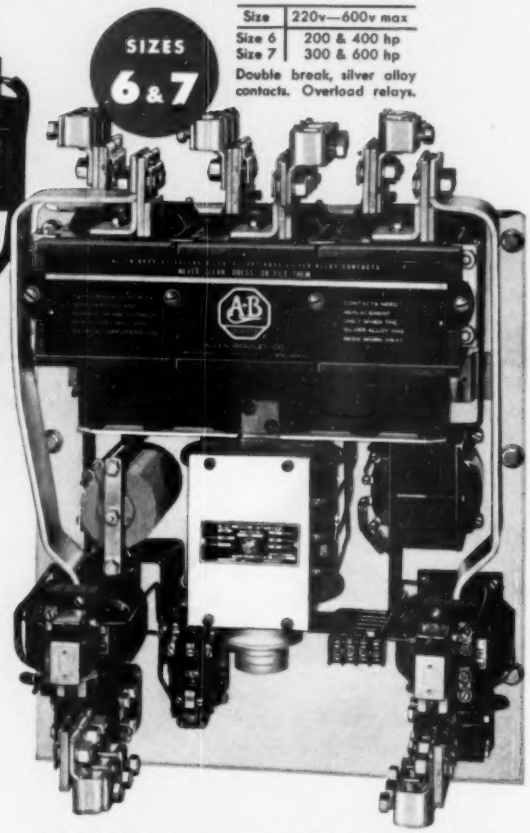


Size	220v—600v max
Size 2	15 & 25 hp
Size 3	30 & 50 hp
Size 4	50 & 100 hp
Size 5	100 & 200 hp

"Hand" or "automatic" solder pot overload relays.

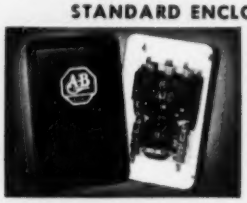
Size	220v—600v max
Size 6	200 & 400 hp
Size 7	300 & 600 hp

Double break, silver alloy contacts. Overload relays.



Allen-Bradley Sizes 6 and 7 Switches are operated with direct current solenoids. The solenoid operating current is obtained from a built-in rectifier and transformer connected to the line through a rugged Bulletin 700 solenoid pilot relay. All frequency hum and "chatter" are eliminated . . . an important feature in large capacity switches.

STANDARD ENCLOSURES



The Allen-Bradley Line is available in standard watertight, dust-tight, corrosion-proof and general purpose enclosures that satisfy every service need.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

5502

A-B Quality

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

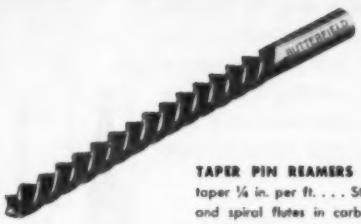
QUALITY

FLEX-RITE REAMERS give greater accuracy, lower costs, higher production rates because unique blade-expansion feature *permits repeated sharpenings without reducing original size.*

WRITE FOR SPECIFICATIONS AND PRICES.

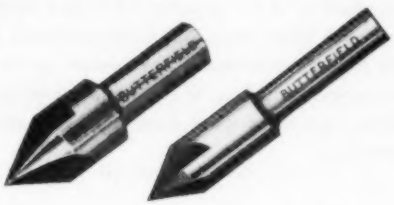
FLUTED CHUCKING REAMERS . . . spiral and straight flutes . . . choice of straight or taper shanks . . . high speed steel.

Now . . . with FLEX-RITE the line of Butterfield 100% Inspected Reamers is Complete



TAPER PIN REAMERS . . . taper ¼ in. per ft. . . . Straight and spiral flutes in carbon or high speed steel. Helical flutes in high speed steel.

HAND REAMERS . . . straight or spiral flutes which are slightly tapered on end and cleared to edge . . carbon or high speed steel. Also expansion type in carbon steel only.



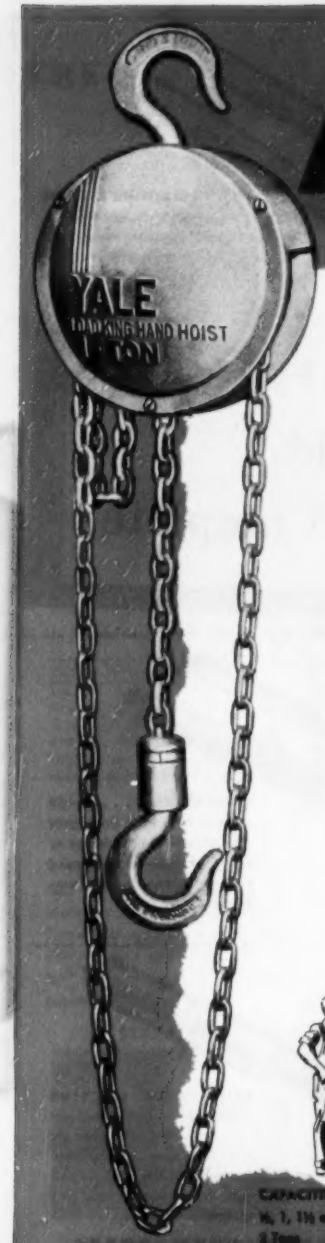
CENTER REAMERS AND COUNTERSINKS . . . 60° and 82° included angle . . . all regular in carbon or high speed steel.

STUB SCREW MACHINE REAMERS . . . high speed steel . . . regular with right hand cut and left hand spiral flutes. Reamers with left hand cut and right hand spiral flutes are special.

UNION TWIST DRILL CO.
BUTTERFIELD DIVISION
Derby Line, Vermont

BUTTERFIELD
THE 100% INSPECTED TOOLS
Every Tool Individually Inspected
TAPS • DIES • REAMERS • SCREW PLATES

NOW YOURS...

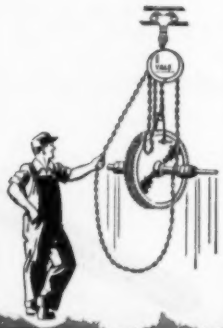


Compact... Lightweight

High strength aluminum alloy castings and alloy steels, fewer parts—these factors provide the "carry-around" lightness of the Load King. The ½-ton model weighs only 37 lbs.! Larger capacities likewise provide unusual lightness for moving the hoist job-to-job in a hurry.

Greater Efficiency

Efficiency up to 95%! It takes only 20 seconds to lift a 1000 lb. load 3 feet. In a minute, 2 tons can be lifted 2.1 feet. Such fast performance is due to minimized friction: *all* rotating shafts have ball bearings, parts are precision machined, and the powerful, revolutionary new Synchro-matic acts quick as a wink.



Easy on Muscles

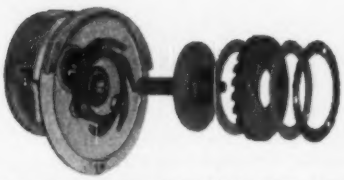
One-half or 2-ton capacity—the Load King is a one-man hoist! Hand pull force necessary to lift the load is maintained at minimum by its high efficiency. Load King operators save energy, feel better, get more work done per hour. Hoisting costs drop.

CAPACITIES
½, 1, 1½ and
2 Tons

YALE
TOOLS THAT KEEP
INDUSTRY "ON THE MOVE"

YALE LOAD KING HAND HOIST

...the New *Lightweight Hoist with the Revolutionary Synchro-matic Load Brake and every other Performance Feature You Want*



You want a compact hand hoist that's easy to move around. You want greater hoisting efficiency to speed production. You want a hoist that doesn't leave the operator droopy and dragged out after a few lifts. You want all these performance features without any skimpiness in quality and durability.

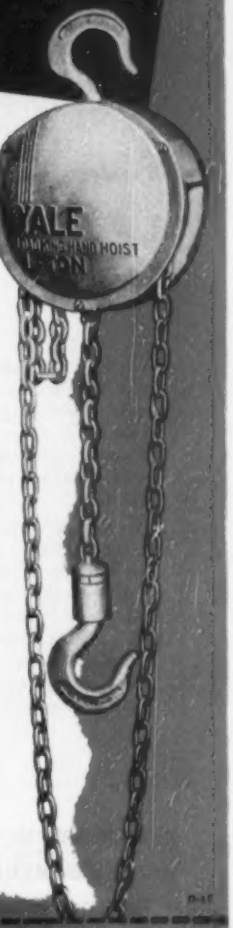
The Yale Load King Hand Hoist gives them to you—and more! For only the Load King employs the new, improved principle of instantaneous brake action provided in the Synchro-matic load brake. Maximum braking power, automatically! A 6-tooth pawl engages a 24-tooth ratchet at 6 points simultaneously with balanced and cushioned spring pressure . . . no side pressure on bearing surfaces . . . longer pawl life. Furthermore, a stabilizer ring gives a soft, even and lighter hand chain pull — speeds brake release for precise inching when lowering a load.

The Load King is a lightweight, powerful, easy-to-use hoist that's really tough—and safe. It has the same rugged stamina that has made Yale Hoists the first choice of industry for more than three generations. Precision engineering, the finest materials, machining to close tolerances, careful tests and inspections — all make the Load King the hoist you can trust to pay off big.

GET ALL THE FACTS

Now is the time to learn all about the new Yale Load King — its powerful Synchro-matic hoisting performance—its attention-free reliability—its enduring quality. Complete information is yours on request. Ask for Bulletin P-1254. Do it today.

PHONE, WIRE OR WRITE YOUR YALE DISTRIBUTOR



MAIL THE COUPON TO HEADQUARTERS
for Bulletin P-1254 and the name of the Yale distributor near you.

WORLD-WIDE
YALE HOIST
SALES and SERVICE
Available Through
Your Distributor

THE YALE & TOWNE MANUFACTURING CO.

YALE

The Yale & Towne Manufacturing Company
Department 7-12
Roosevelt Blvd. and Haldeman Ave., Philadelphia 15, Pa.

☐ Send me Load King Hand Hoist Bulletin P-1254.
☐ Give me the name of the nearby Yale distributor.

Name .....
Company .....
Address .....
City and Zone ..... State .....

What every good production man should know about—

Production advantages of

Magnesium Die Castings

It is among production men who have worked with magnesium die castings that magnesium finds some of its strongest supporters. These men know from actual experience that light, strong magnesium die castings have production advantages not offered by any other die casting metal.

Magnesium's freedom from a tendency to solder to the steel dies or cores is an important production plus. This makes it possible to produce castings with extremely small cored holes and holes with little taper and in special cases without taper. Consequently castings that require complicated coring are generally easier to produce in magnesium. Another inherent advantage of magnesium die casting alloys is the absence of growth in dimension with age. Tolerances of ±0.0015 inch per linear inch can be maintained on production runs.

Any machining required can be done faster and more economically on magnesium, for it's easiest of all die casting metals to machine. Magnesium die castings are readily adaptable to a wide variety of protective and decorative finishes.

Most important of all, *magnesium die castings are competitively priced!* In general, they cost no more than die castings in other materials, and in some cases they are cheaper.

Get more information about how magnesium die castings can cut your production costs. Call the nearest Dow sales office or write direct.

MAGNESIUM CAN ALSO BE ECONOMICALLY FABRICATED INTO

EXTRUSIONS

Magnesium can be extruded into an almost unlimited variety of shapes and sizes. Tailored to the job, they can often eliminate costly forming and fabricating.

SAND AND PERMANENT MOLD CASTINGS

Magnesium sand and permanent mold castings are used where light weight, high strength, resistance to shock and excellent machinability are required.

SHEET, STRIP AND PLATE

These forms have the same high strength-weight ratio possessed by other forms of magnesium. For sheet applications requiring lightness, rigidity, and durability, try magnesium.

Magnesium Division, Dept. MG-42 • THE DOW CHEMICAL COMPANY • Midland, Michigan

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

MAGNESIUM

Many Finishes Available for Magnesium

Magnesium alloys exhibit good resistance to weathering under ordinary atmospheric conditions and have given good service in many industrial applications for the past quarter of a century. There are a great variety of easily applied protective and decorative finishes available to further improve magnesium's surface stability.

Bright metallic or frosted luster and other decorative effects are easily obtained by chemical baths and colored coatings can be produced by use of anodic treatment. For best results, decorative finishes are followed by clear lacquer or waxing. Dow research has recently developed an electroplating process that permits the economical use of all common plating metals on magnesium.

The application of paint systems to magnesium requires the same techniques used for other metals. Paint should be applied over properly chemically treated surfaces.

For information on finishing magnesium call the nearest Dow sales office or write direct.

Things to Remember

1. Always paint over properly treated surfaces —recommended chemical treatments are available.
2. Be sure surfaces are clean and dry before each coat of paint is applied. A large percentage of paint failures can be attributed to painting of damp or improperly cleaned surfaces.
3. Choose priming and finishing materials with care. Always use a material recommended for the job.

MACHINING

Magnesium permits deeper cuts and higher feeds and speeds than any other metal. The absence of any tendency to tear or drag results in excellent surface finish. Tapping can be done at high speeds.

FORMING

The recognized practice of hot forming magnesium permits deep draws in one operation —eliminates repeated annealing and multiple sets of dies.

JOINING

Established and well defined procedures are used in joining magnesium. All the usual methods employed on other metals including riveting, welding and brazing are in common use.

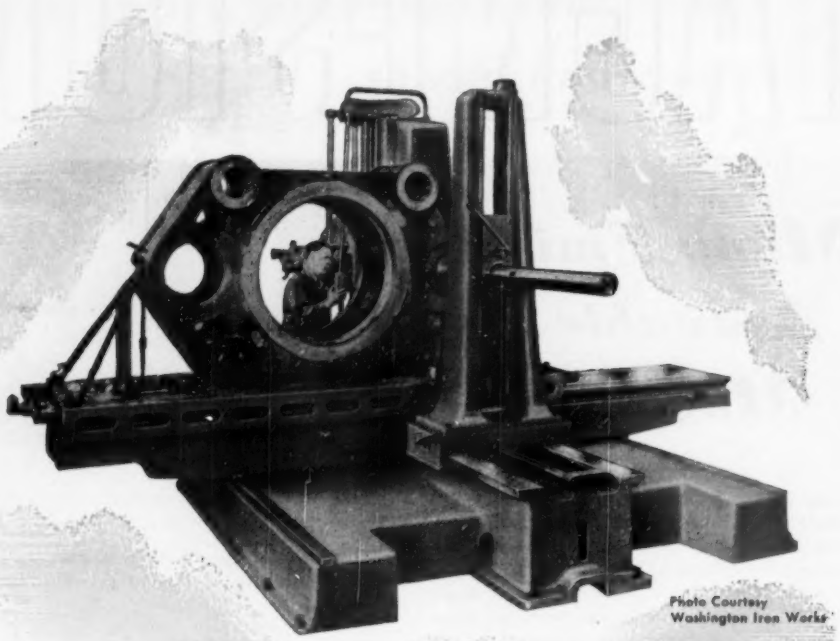


Photo Courtesy
Washington Iron Works

"THIS LUCAS CUTS COSTS IN HALF," says the owner

New Series 542 B-120, 4-way bed, Lucas shown here set up to line bore a 5 ton steel casting. Extra wide 120" bed permits long table cross travel. Outer ways are cast integral with bed.

In the plant of Washington Iron Works, Seattle, Washington, working on pieces up to ten tons, "Production time was improved 59% on one typical operation — 40% on another, compared with previous methods using other modern machine tools," to use the customer's own words.

Whether your work is large or small, single pieces or production operation, there's a Lucas size and type for your needs. Write for literature.

LUCAS OF CLEVELAND

LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Crucible Steel Company of America
Dept. A, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

CRUCIBLE first name in special purpose steels

TOOL STEELS

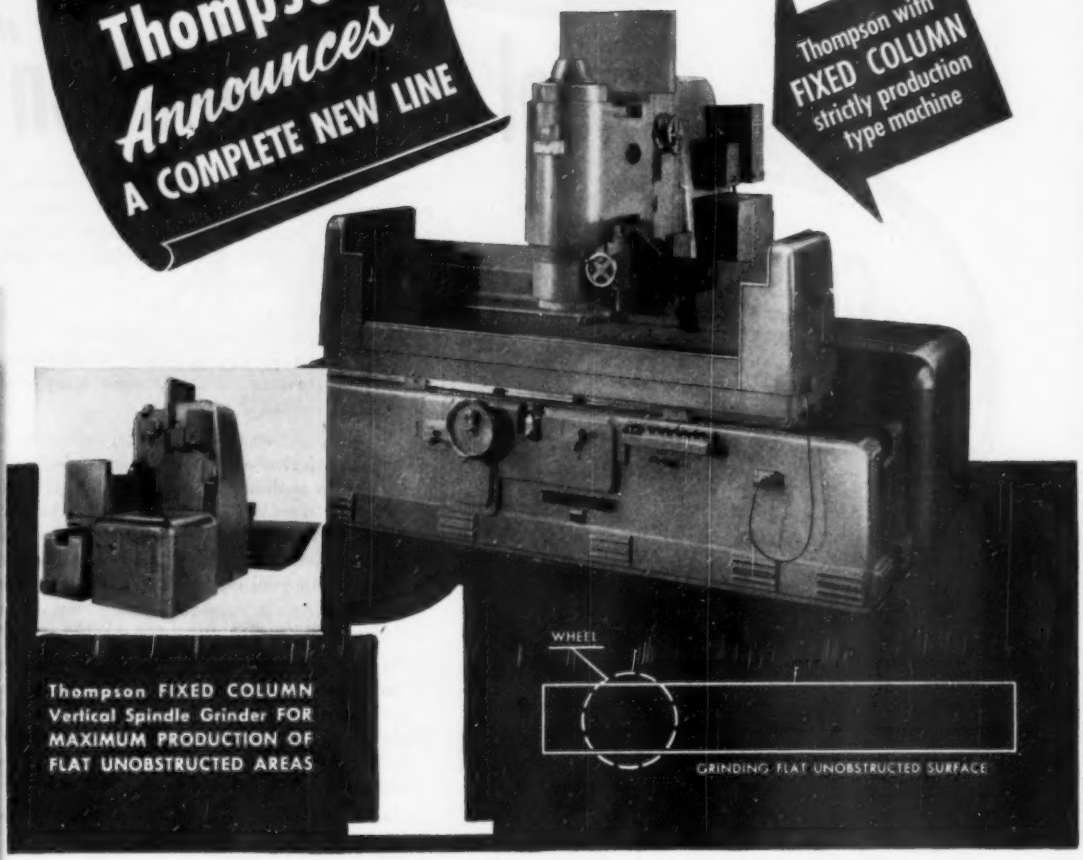
fifty years of Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

Vertical Spindle

Thompson Announces A COMPLETE NEW LINE

Thompson with FIXED COLUMN strictly production type machine



Thompson FIXED COLUMN Vertical Spindle Grinder FOR MAXIMUM PRODUCTION OF FLAT UNOBSTRUCTED AREAS

● Lowered mass production machining cost of large and small unobstructed flat surfaces is the prime advantage of Thompson's new Fixed Column Vertical Spindle Surface Grinders with reciprocating tables. These new machines meet the recognized production grinding needs of industry better than any other machine because they are super rigid for utmost precision and combine many exclusive Thompson features for high stock removal, ease of operation and lowered maintenance.

All Thompson Fixed Column Vertical Surface Grinders are fully hydraulic with simplified circuits which meet the standards for hydraulic machine tools. A range of sizes are available as follows: 12x18x36 to 12x18x60; 18 x18x50 to 18x18x190; 28x24x60 to 28x24x120.

Modern Thompson features of highest quality built into these new vertical machines include: precision wheelhead dynamically balanced; bearings life-time lubricated; automatically lubricated double-table-length bed ways; vertical rapid traverse; table retard at limit of stroke; simplified controls with automatic down feed; angular head adjustment; adjustable splash shield; table surface clear of wheel at either end of stroke; anti-friction elevating nut and many other exclusive Thompson quality features. Please write for complete specifications.

Both Thompson Fixed Column and Hydrovert Machines are covered by U. S. and Foreign Patents.

THE ONLY MANUFACTURER OF A COMPLETE RANGE OF HEAVY DUTY AND LIGHT DUTY SURFACE AND CONTOUR GRINDERS FOR INDUSTRY.

Production Surface Grinders

(with reciprocating tables)

Thompson HYDROVERT Vertical Spindle Grinder FOR MAXIMUM PRODUCTION ON OBSTRUCTED OR MULTI-LEVEL SURFACES AND ANY SIZE FLAT SURFACE

2

Thompson HYDROVERT Vertical Surface Grinders with reciprocating tables offer unlimited grinding of any flat surface . . . without qualification as to obstructions and to width of work as shown in the drawings above.

In addition to all of the quality features found in Thompson Fixed Column Machines, Thompson HYDROVERTS have sliding columns. The entire column travels back and forth on a sub base, as illustrated, giving either an intermittent feed at each reversal of the table, or a continuous cross feed. The machines are also equipped with hydraulic hand cross feed for rough setting of the wheel, and for grinding close to obstructions or shoulders.

A smaller diameter wheel on HYDROVERTS gives full range capacity permitting use of harder wheel and greater depth of cut. Thompson HYDROVERTS are available in sizes from 16x24x48 to 48x24x192.

Each Thompson Vertical Spindle Machine provides the utmost in accuracy, finish and high production. Without obligation on your part, feel free to let us have your vertical spindle grinding problems for estimates and complete specifications. Write today.

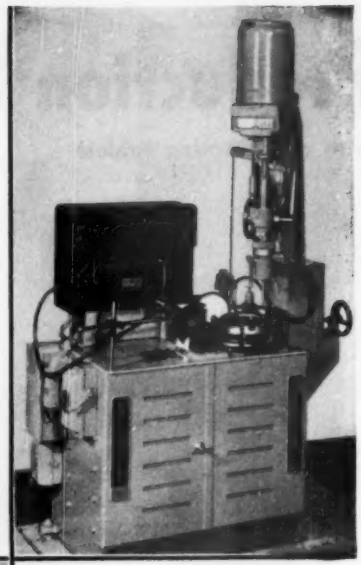
Thompson SURFACE Grinders

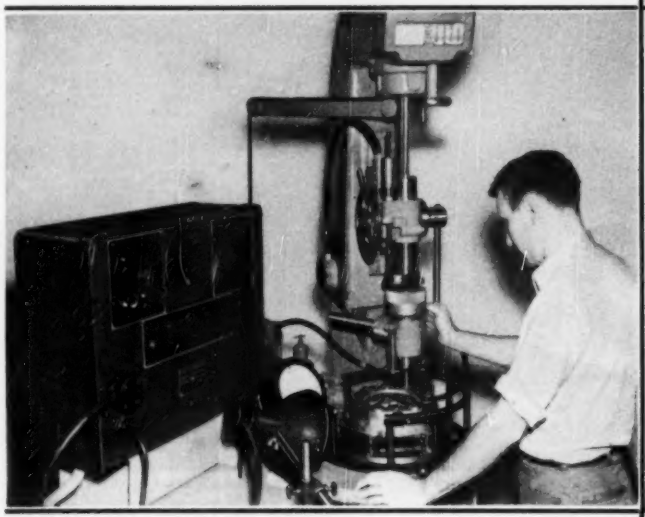
THE THOMPSON GRINDER COMPANY
Dept. 10, Springfield, Ohio

MACHINE BALANCES CLUTCH ASSEMBLIES!

Phenomenal speed and accuracy are achieved with the Gisholt machine which performs all four steps in the complete balancing operation as follows: (1) locates unbalance, (2) measures unbalance, (3) corrects unbalance, (4) checks balance. Designed especially for this work, the machine handles operations at the rate of 80 pieces per hour.

Gisholt ISV Dynetric Balancer

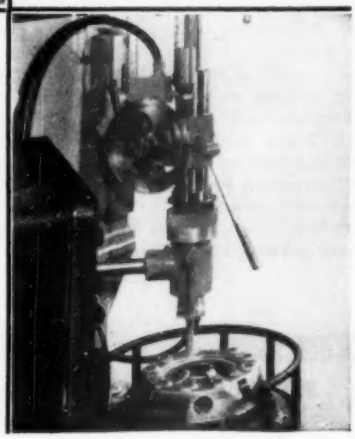




Saves handling time
With correction drill incorporated as a part of the machine, it is unnecessary to remove work piece from mounting for drilling. Handling time is cut to a minimum.

Corrections clearly indicated
Readings clearly show where and how much metal is to be removed in units of drill depth. All chips are automatically ejected so they cannot get caught in the clutch pressure springs.

Insures better service Whether it's in production or repair work, the balancing of clutch plate assemblies is of little avail unless it is done *accurately*. And here, again, the DYNETRIC principle provides the accuracy which makes Gisholt the unquestioned leader in the field of balancing. Full information on request.



GISHOLT MACHINE COMPANY
Beautiful Madison, Wisconsin

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES
BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

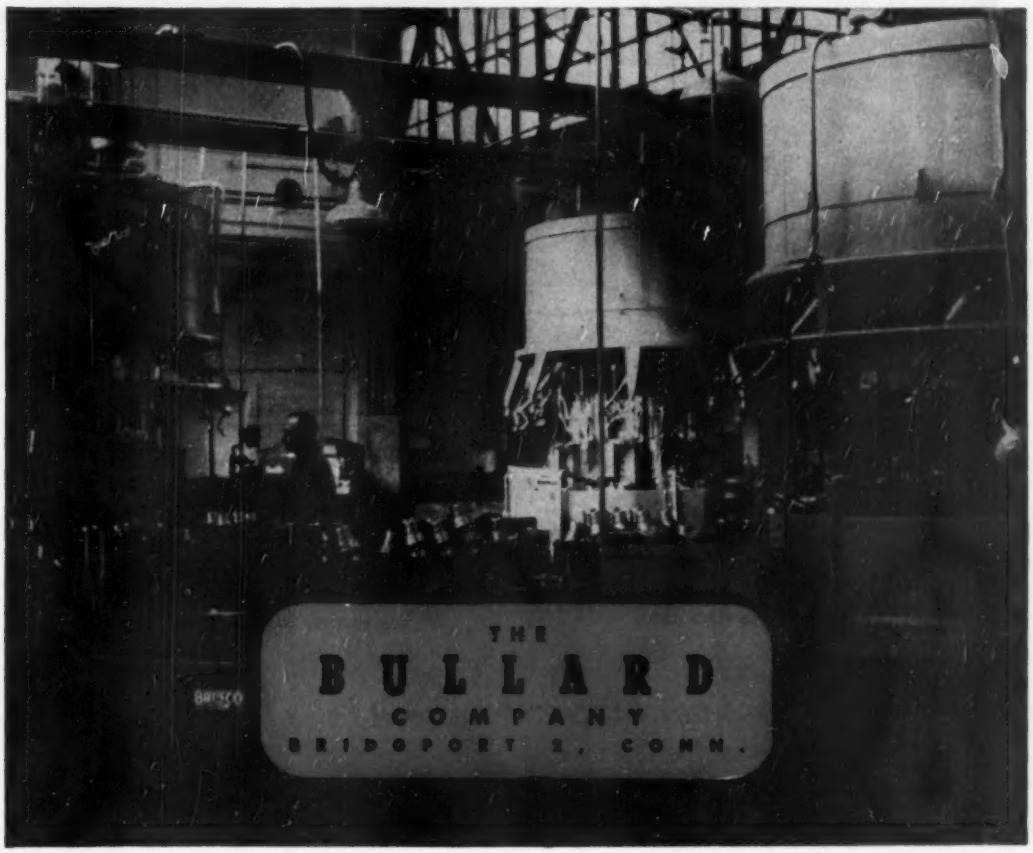
KEEPING PACE WITH TIME . . .

Bullard Mult-Au-Matics

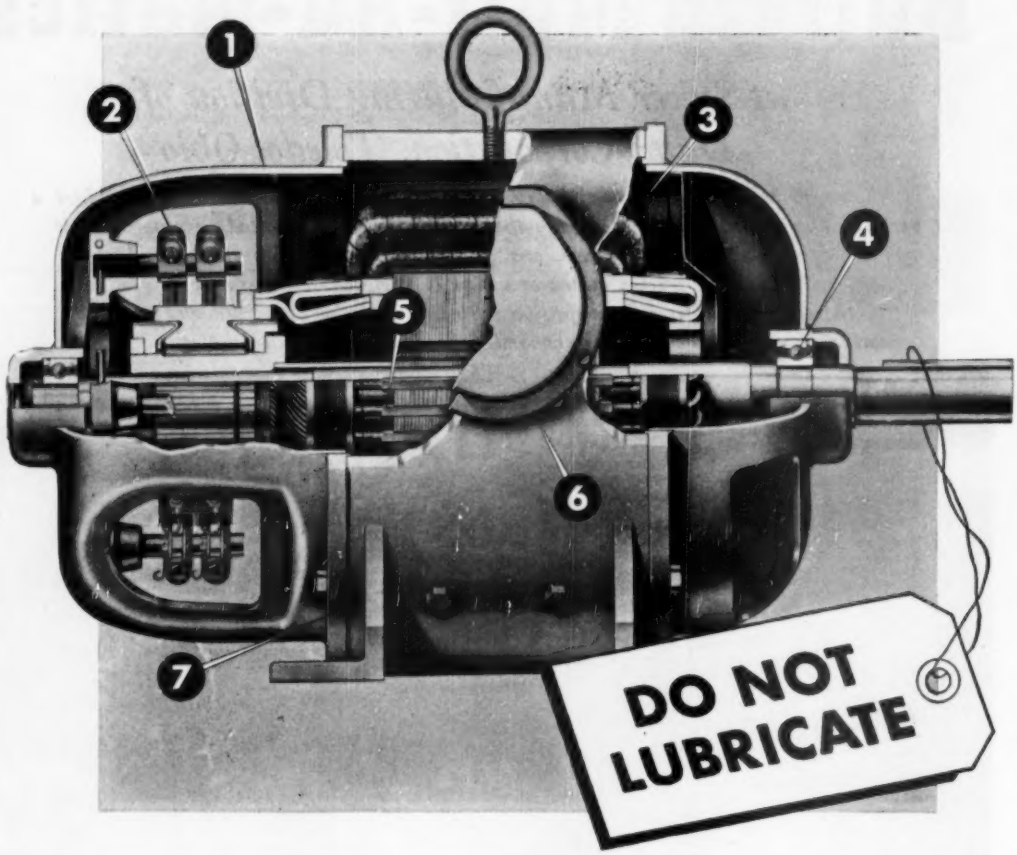
at Spicer Manufacturing Division of Dana Corporation, Toledo, Ohio

Some 30 Mult-Au-Matics — eight spindle type, in 12 and 16 inch sizes, produce a variety of automotive parts. Naturally these machines were installed because of their productive capacity. Since, one Mult-Au-Matic produces the equivalent of three former machines which it replaced. Furthermore, the customer expressed satisfaction with the dependable performance of these machines and remarked on the economies possible with Mult-Au-Matics.

Write BULLARD for Factual Time Savings on your Jobs



YOU CAN BE **SURE**.. IF IT'S
Westinghouse



1. ALL-STEEL BRACKETS
2. INDIVIDUALLY REMOVED CAST BRASS BRUSHHOLDERS
3. SHELL-WOUND FIELD COILS
4. DOUBLE-SEALED PRE-LUBRICATED BALL BEARINGS
5. HEAVY-DUTY PRESHAPED ARMATURE COILS
6. STEEL-GASKETED CONDUIT BOX
7. ROLLED-STEEL FRAME

If you figure LIFE-COSTS... you'll figure LIFE-LINE

SK DEPENDABILITY
Wrapped in Steel
in the NEW Life-Line D-C MOTOR

Thirty-nine years at hard labor—in steel mills . . . in mines . . . in a thousand and one applications—have proved the dependability of the type SK d-c motor. Now, new dependability has been added—new motor stamina . . . new freedom from maintenance . . . new value for d-c motor users.

MAXIMUM STRENGTH AND RIGIDITY—Heavy steel end brackets and rolled-steel frame stand up to the shocking, jarring blows so often encountered in rugged d-c service.

SIMPLIFIED SERVICING—Readily accessible through spacious opening in front bracket, brushholders may be removed individually. Armature coils, wound from Tufvar wire and treated in Thermoset varnish assure long life . . . reduce trouble from shorts and grounds. Double-sealed pre-lubricated bearings (proved in over half a million motors) put an end to greasing problems.

INDIVIDUAL FIELD COIL UNITS—One coil may be replaced without expense of replacing all . . . or discarding pole piece. Just slip the new coil in place . . . save repair costs.

These are a few highlights of the new, all-steel Life-Line type SK d-c motor. Get the complete facts on series, shunt, or compound motors . . . frames 203-365 . . . in 1 to 30 hp ratings. Contact your local Westinghouse representative. Ask for a copy of "D-C Motor" Booklet B-4595, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21549

Westinghouse
Life-Line
D-C Motors

Anaconda

Land of the free!

. . . where enduring copper is a symbol of our better way of life . . . where copper and its alloys provide a myriad of useful, low-cost, mass-produced conveniences. Take this Jarco Key-Chain Flashlight: Solid brass deep-drawn shell and cap; solid brass screw-machined, threaded and knurled nut; solid brass bead chain; battery, tension spring and focused bulb. Made by Jarco Metal Products Corporation, New York. Sold by the millions at 39¢ retail.

It works – weather or not

When the H. S. Getty Company, Inc., Philadelphia, designed its "Internal Gear Construction Window Operator," many difficulties presented themselves. First, it had to be non-rusting, corrosion resistant and yet moderate in cost. Regular brass alloys answered that. But—some parts, such as the operating arm and machine-cut worm, needed extra strength and stamina to resist the stresses caused by rain-swollen or iced-up sash. Everdur, The American Brass Company's Copper-Silicon Alloys answered *that* . . . proving what we've been saying right along—that there's an Anaconda Copper Alloy available to do 'most *any* kind of job. And economically, too!

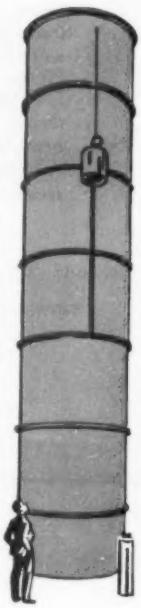
Twenty years –

That's not a sentence. It's a guarantee that goes with every automatic water heater sold by Bauer and Company of Hartford, Conn. One big reason why is that Everdur*, carbon-arc welded, is used for the non-rust tank. Coincidentally, twenty years ago the Bauer Company discovered the merits of this Copper-Silicon Alloy—strength, corrosion resistance, workability and weldability—and has been using it ever since for tanks ranging from 2½ to 150 gallons. Dependable stuff, that Everdur.

*REG. U.S. PAT. OFF.

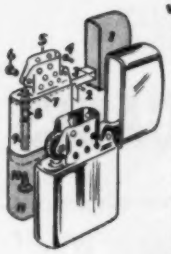
Schenley sets up a tall one

Ever wonder why copper has been used so long—and so diversely—in breweries and distilleries? The question is prompted by this three-story still, one of the many pieces of equipment made of copper in the new Canadian Schenley Limited distillery at Valleyfield, Quebec. The answer: Copper is readily worked into the unusual shapes and forms required; it provides high corrosion resistance, and never rusts to contaminate products; it's tops in rapid heat transfer; it can be readily and dependably joined by soldering, brazing, oxyacetylene welding, or by the newer carbon arc, inert-gas-shielded welding method. Most of the equipment for the Schenley plant was fabricated in Canada by Canadian-Vickers Limited of Montreal—of Anaconda Copper, of course.



P.S. If you are having difficulty in selecting a metal for a particular application, let us help you with it. Talking about it entails no obligation—and our vast experience places us in a position to come up with the right answer. Address The American Brass Company, Waterbury 20, Conn.

Metals at work



"No Zippo owner ever spent a cent for repairs"

That is the unqualified, unconditional guarantee held by millions of Zippo Lighter owners. How does Zippo do it? First, the design is excellent. Second, meticulous care is employed in manufacturing. And third, the right metals are used in the right places . . . metals that are easy to fabricate, economical to finish and that do their assigned jobs for years on end. You guessed it. Eleven components of the Zippo Lighter are made of Anaconda Brass and Nickel Silver Alloys in the form of strip, wire, rods and tubes.

We take our own medicine

And it's good! For years we've been extolling the merits of welding with Bronze. Then our subsidiary, the American Metal Hose Branch ran into a toughie—braze-welding the fittings on these 2½" diameter Vibration Eliminators for refrigeration lines. The assembly includes a thin-wall flexible bronze tube, a rigid copper tube fitting, a copper ferrule, and—672 strands of .028" bronze wire. Result: a strong, ductile, vibration-resistant weld, absolutely leakproof against the most searching refrigerants. Want a booklet on Anaconda Bronze Welding Rods? Ask for Publication B-13.

Stuffed with Copper

Ever since The American Brass Company developed a means of producing electrolytically deposited copper in practically unlimited lengths, new uses for this paper-thin metal pop up continuously. Most recent is the application of "Electro-Sheet" in Multi-Velocity Air Filters, made by Research Products Corp., Madison, Wis. The copper, slit and expanded, has important advantages over other materials: Light weight, high dirt-holding capacity, non-clogging and improved cleanability features; and lower restriction at all air velocities up to 550 feet per minute. Just in case you want to know, "Electro-Sheet" is available in thicknesses from .00068" to .0094", in widths up to 62"

Look this way, please

Designed to sell at $14.95, the Beacon "225" Camera, produced by Whitehouse Products, Inc. of Brooklyn, N. Y., introduces a degree of precision befitting much more costly cameras. Handsomely styled, the Beacon "225" uses standard film and is inexpensive to operate. This policy of offering high-quality at low-cost has met with marked success, for more than 300,000 Beacon Cameras have been sold to date. Dozens of the intricately formed camera parts, made of copper base alloys, were produced by our Waterbury Brass Goods Branch—in large quantities, inexpensively, to unusually close tolerances in multiple die production. If you're interested in this type of work your sample, sketch or description will start the ball rolling.

Out of sight but not out of mind

Maybe you never gave a thought to those gas service lines that run from the main into the house. But you can bet your gas company does, for replacing rusted out steel services is a major item of maintenance expense. So . . . twelve years ago a large midwest utility started replacing gas service lines with copper tube—very often eliminating trenching by pulling the smaller 1" or 1¼" tube through the reamed-out steel pipeline. 25,000 replacements have been made by this one company alone, and—surprise—the total cost of a rust-free copper renewal is considerably less than that of a steel replacement!

ANACONDA

the name to remember in

COPPER, BRASS & BRONZE

Preferred... for many reasons

No. 6 6" to 12½"
No. 5 3⅝₂" to 6½"
No. 4 2⅛" to 3⅛"
No. 3 1½" to 2⅝₂"
No. 2 1" to 1¹⁷⁄₃₂"
No. 1 ⅝" to 1"
No. 0 ⅜" to ⅝"
DIFFERENT TYPES to fit different jobs. Dimensions above 1"
VERTICAL 90° TYPE
VERTICAL TYPE
PISTOL-GRIP TYPE
7 SIZES cover range ⅜" to 12½"

STANDARD

DIAL BORE GAGES

The favorite with men who know precision work

... and here are the "Reasons Why"

COMPACT DESIGN Our painstaking design and research methods have produced a gage that's easier to handle. No cumbersome head in the STANDARD Dial Bore Gage.

REPEATABILITY and ACCURACY Repeats consistently within 20 millionths of an inch. The 2-point measuring principle and 3-point alignment of these gages assure accuracy.

POSITIVE CENTRALIZING MECHANISM Centralizing plungers work together; keep line of measurement through center of bore at all times. Sizes 2 through 6 have centralizing plungers which are approximately radial.

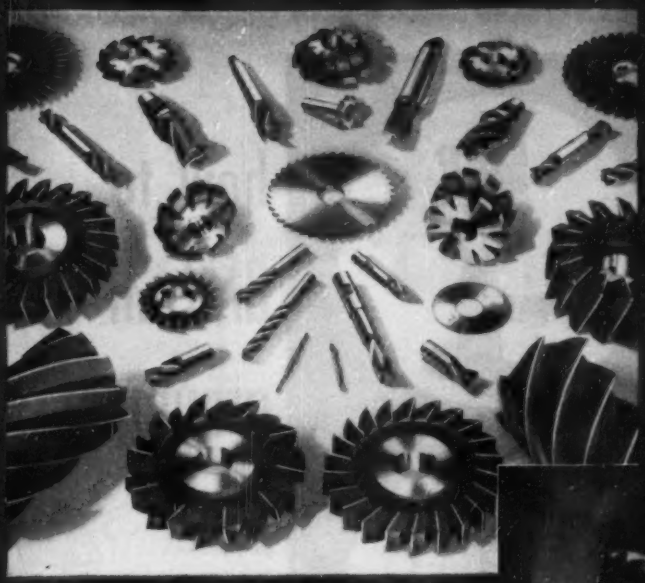
SPECIAL APPLICATIONS **The LONG and SHORT** **OF IT!**

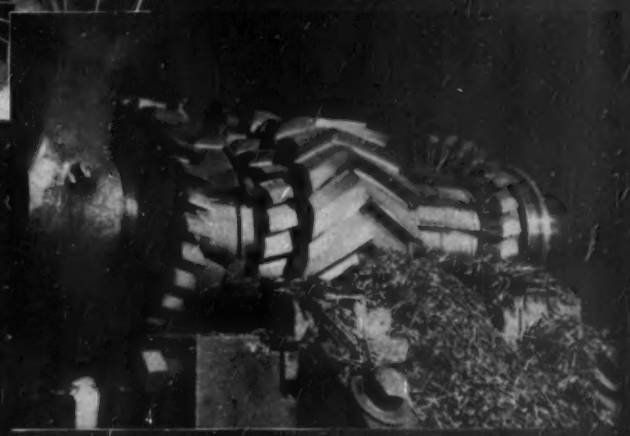
We have been highly successful in developing special gages to solve tough problems, such as extra long bores or jobs with limited free working space.

Indicator graduations available in .001", .0005", .0001", .01mm, .005mm, .002mm.

Contact points may be had in hardened steel, tungsten carbide, Norbide or diamond.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.





. . . because they're made by a BIG USER of all types of Cutters!

In the process of manufacturing an unsurpassed line of machinery, tools and other products, Brown & Sharpe is one of the world's largest *users* of milling cutters. Brown & Sharpe cutter design engineers have the opportunity to see at first hand the needs for specific jobs, and how the many possible solutions work out. This system of design, trial, and improvement tolerates no second best results. In each and every cutter application, Brown & Sharpe manufacture demands the best, and Brown & Sharpe experience is able to produce it.

The benefits of this experience are passed on to you in the Brown & Sharpe line of milling cutters. For your best assurance of low real cutter cost, and efficient cutter operation, select the cutters with the "experience background"—cutters with the laboratory and experimental work *behind* them — cutters that have passed the most strenuous, exacting tests of performance.

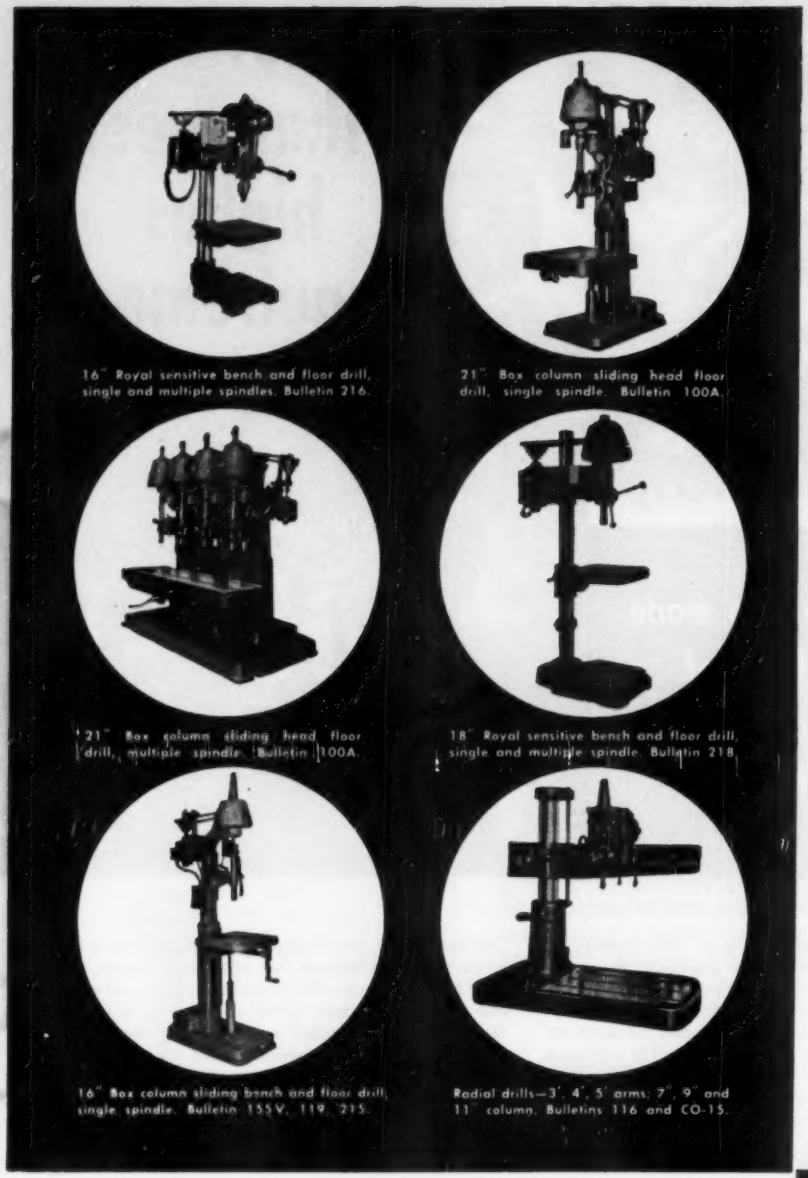
Ask for Brown & Sharpe cutters at your industrial supply distributor's. Or write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

A COMPLETE LINE OF MILLING CUTTERS

PLAIN MILLING CUTTERS • HELICAL PLAIN MILLING CUTTERS • SIDE MILLING CUTTERS • STAGGERED TOOTH SIDE MILLING CUTTERS • INSERTED TOOTH CUTTERS • END MILLS • ANGULAR CUTTERS • CONVEX AND CONCAVE CUTTERS METAL SLITTING SAWS • SCREW SLOTTING CUTTERS • SPROCKET WHEEL CUTTERS • GEAR CUTTERS

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S


16" Royal sensitive bench and floor drill, single and multiple spindles. Bulletin 216.
21" Box column sliding head floor drill, single spindle. Bulletin 100A.
21" Box column sliding head floor drill, multiple spindle. Bulletin 100A.
18" Royal sensitive bench and floor drill, single and multiple spindle. Bulletin 218.
16" Box column sliding bench and floor drill, single spindle. Bulletin 155V, 119, 215.
Radial drills—3', 4', 5' arms; 7", 9" and 11" column. Bulletins 116 and CO-15.

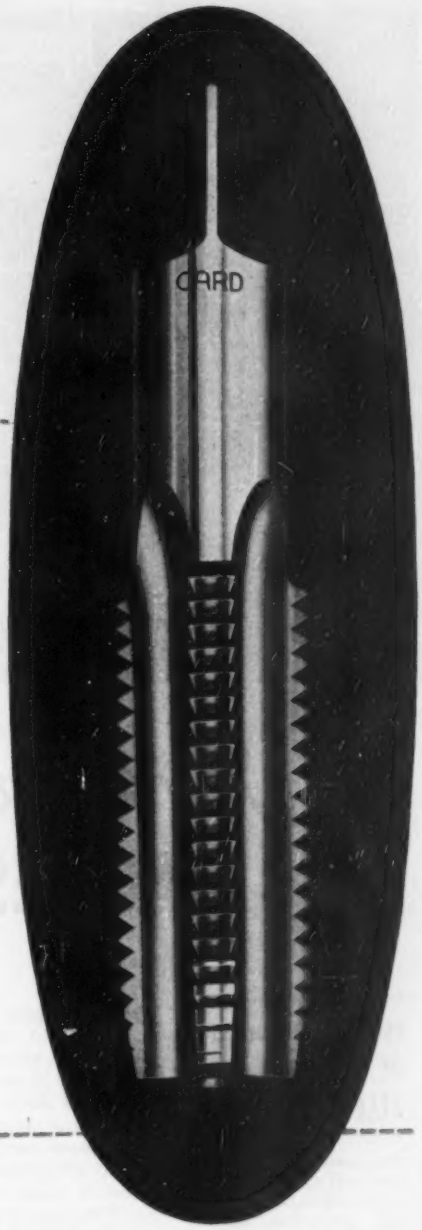
how to drill an argument full of holes

The familiar "we can't afford it" argument will very likely go to pieces when matched against high money saving productivity and low initial cost in the Canedy-Otto Cincinnati line of light, upright, sensitive and radial drilling machines. They offer the sizes, types, speeds, feeds and adaptability to fit better than 90% of your drilling requirements... The Canedy-Otto line is now backed by a leading name in lathe manufacture. Write for latest literature.

CANEDY – OTTO

cincinnati LATHE & TOOL COMPANY • CINCINNATI 9, OHIO

CARD
Ground Thread
TAPS



Standardized Accuracy... At Ordinary Tap Cost!

Card's extreme care in maintaining utmost accuracy is a *plus* that lifts Card Certified* Taps away above the ordinary. Costing no more than run-of-the-mill taps, they're your best possible buy for dependability and long, economical use.

Card Taps are available in both commercial ground and precision ground threads.

When precision ground is required, be sure to specify the limit number.

Your nearby Card Distributor will be glad to supply you with these accurate, top quality taps — and to cooperate with you in every way. Contact him for prompt, helpful service.

The CARD Quality

TAPS

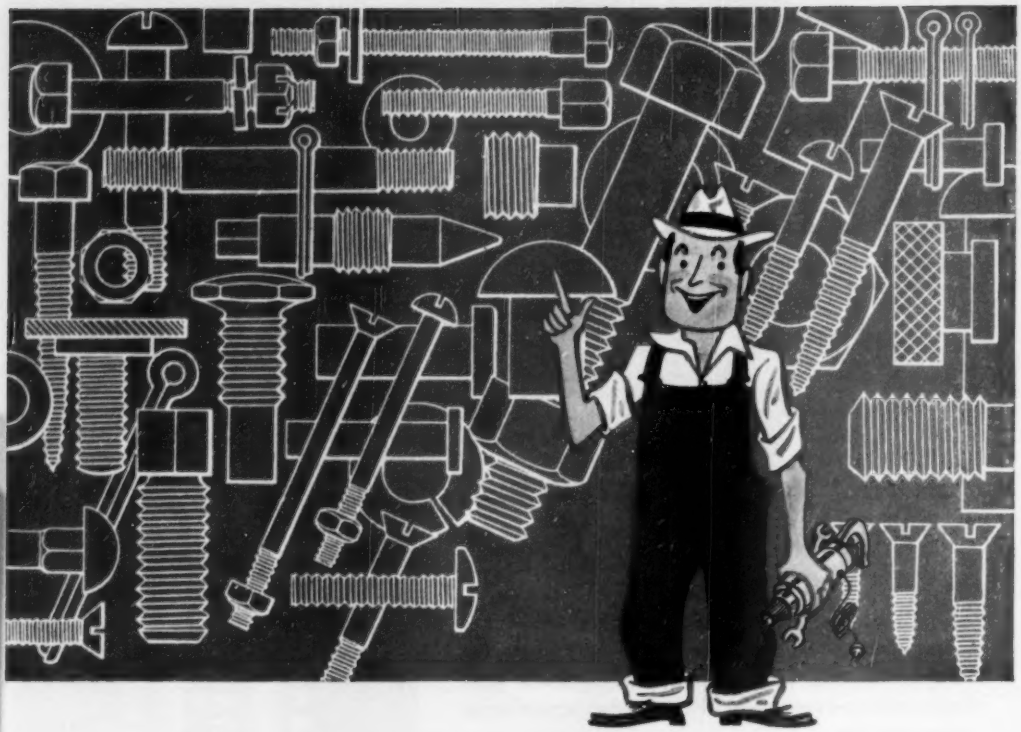
The Certified Cutting Tools*

*by the Pittsburgh Testing Laboratory

Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

S.W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL COMPANY



You'll get a Better Job with STAINLESS STEEL FASTENERS

LEADING PRODUCERS OF FASTENERS USE ALLEGHENY METAL

A complete line of stainless steel fasteners—all types and sizes of bolts and nuts, rivets, wood and machine screws, cotter pins, washers, etc.—are made of Allegheny Metal by the leading manufacturers in this field. Get in touch with them for catalogs and prices, or write us direct.

ADDRESS DEPT. AM-9

PITY the poor fasteners! All they do is hold just about everything together . . . and isn't that an important enough job to warrant using the *best* —the kind made of stainless steel?

After all, nothing is any better than the bolts and nuts, rivets, nails, screws or pins which assemble it. That's why fasteners made of Allegheny Metal *pay.* They're a sure sign of quality and value at little, if any, extra cost . . . won't wear out, can't wear off, resist rust and heat, stay bright and strong agelessly. You can use them on wood, plastics or other metals—and if it's important, there's a high re-use factor.

Allegheny Metal fasteners are available in complete variety, made by the leading manufacturers in this field. Check up on what they'll do for *you,* won't you?

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Pa.

Nation's Leading Producer of Stainless Steels in All Forms

AL

W&O 2601

ALLEGHENY METAL is stocked by all Joseph T. Ryerson & Son, Inc. warehouses

BIG

Production Performance ... Profit Potential

WITH 4-HEAD NEW SERIES KING

New Series 144" KING turning the truck frame of a Bucyrus-Erie power shovel. All four heads are operating at once. The two swiveling side heads permit machining the tapered roller track with single point tools, at much higher speed than would be possible with a large form tool.

Here's another striking example of costs brought down . . . *down* . . . DOWN, with New Series KING Vertical Boring & Turning Machines. KING Mills save time, save money, improve quality, on the *complete* range of vertical boring and turning work—light or heavy, large or small. It will pay *you* to investigate KING cost-cutting advantages. Ten sizes—30" to 144"—the *widest* size range among general-purpose vertical boring mills.

WRITE FOR NEW CATALOGS!

New Illustrated KING Catalogs give full description of machines and detailed specifications. Catalog K-1 features Machines sizes 30", 36", and 42"; K-2, sizes 52", 65", and 72"; K-3, sizes 84" and 108"; K-4, sizes 120" and 144".

American Steel Foundries

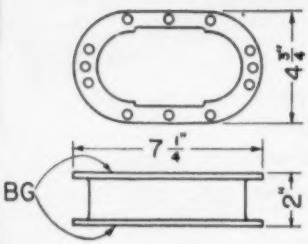
KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

BLANCHARD *is BEST...*

for roughing and finishing parts such as these



Pump bodies are typical of a wide variety of jobs requiring one operation to remove stock from the rough casting, then a finishing operation for extreme flatness and close size tolerances.

For heavy roughing, use the Blanchard No. 18. On this job, 22 pump bodies are rough ground in one chuck load. .100″ is removed per side.

For accurate finishing, use the Blanchard No. 18. 16 pump bodies are finished in one chuck load to a tolerance of ±.0003″ and flat to .0003″ to assure a tight joint.

For fast heavy roughing or accurate finishing, use the Blanchard No. 18. These parts are produced at the rate of 38 pieces (76 surfaces) per hour.

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

. . . a type for every duty, protection against all exposures

FROM the complete Gulf line of quality rust preventives, you can select the proper coatings to fit the desired methods of application, types of metal, length of time for which protection is required, conditions of storage or shipment, and ease of removal.

Gulf makes available both oil- and petrolatum-type rust preventives for both interior and exterior use—including the well known Gulf No-Rust C (polar type) which displaces residual moisture on metal surfaces and lays down a protective coating; and Gulf No-Rust Engine Oils, which prevent corrosion caused by products of combustion left in internal combustion engines.

A Gulf Lubrication Engineer will be glad to co-operate with you in the solution of your corrosion problems. Write, wire, or phone today.

Gulf Oil Corporation · Gulf Refining Company
GULF BUILDING, PITTSBURGH, PA.
Sales Offices - Warehouses
Located in principal cities and towns throughout Gulfs marketing territory

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company AM
35Z Gulf Building, Pittsburgh 30, Pa.
Please send me, without obligation, a copy of your new pamphlet "Gulf Rust Preventives."
Name.....
Company.....
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Address.....

How to make PLANNED assembly savings PAY OFF!

STRONGER ASSEMBLY, TOO, IS CHILD'S PLAY

When the Bender Playground Co., maker of the Bender Stainless Steel Slide, was searching for a way to strengthen its product, P-K Self-tapping Screws were tried out. Results were so satisfactory that P-K Screws are specified today for every Bender Slide. Each slide contains 40 Type "A" Phillips Head Self-tapping Screws—air driven through steel into wood. "They hold better . . . don't come loose," reports the manufacturer. Why not invite a P-K engineer in to discuss your problem? You may be able to make similar savings.

Being on the lookout for better ways of doing old familiar jobs led this manufacturer to try Self-tapping Screws. Being, as well, a smart businessman—he naturally knew apparent savings do not always prove out. So, to make sure, he *wisely* chose P-K Self-tapping Screws. For performance, not price, is the only safe yardstick to use in figuring the ultimate cost of fastening methods.

Screws that don't Measure up cause costly Slowdowns

Screws that are the wrong type, that break or otherwise don't measure up, can quickly ruin your carefully *planned* savings. That's why successful manufacturers everywhere insist on Parker-Kalon Self-tapping Screws. Parker-Kalon originated the Self-tapping Screw. Throughout 35 years of manufacture, P-K has maintained its high quality standards—standards that keep assembly lines trouble-free.

P-K* has the RIGHT fastener for every job

Parker-Kalon makes a complete line of Self-tapping Screws. P-K is able to fit the fastener to the individual application—never requires you to fit the job to a certain type fastener. Find out for yourself why so many nationally known manufacturers say—"If it's P-K . . . it's O.K." Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y. Sold everywhere through accredited Distributors.

*TRADE MARKS REG. U.S. PAT. OFF.

TYPE A WITH PHILLIPS RECESSED HEAD
(Also made with slotted head)

P-K TRADE MARK

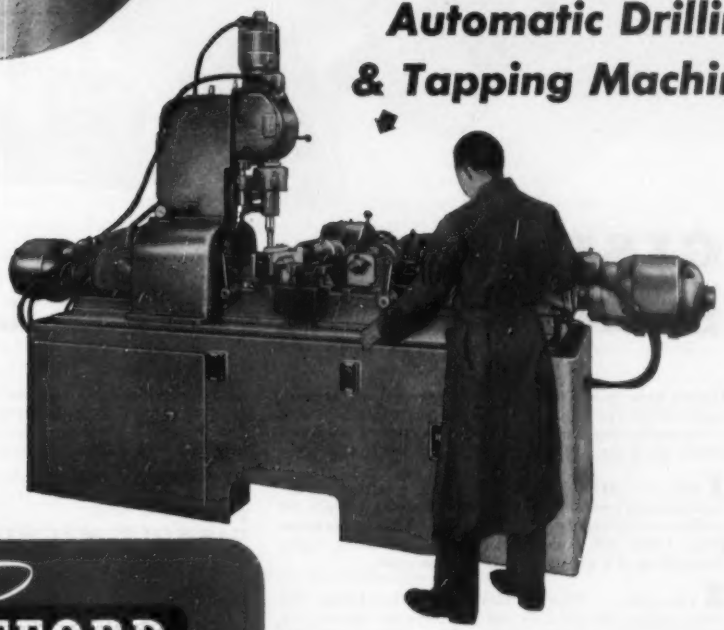
The Original

PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

150 PCS. PER HOUR...

drilled, chamfered bored & tapped on one Hartford Special Automatic Drilling & Tapping Machine



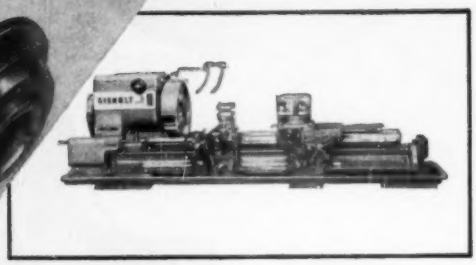
HARTFORD *Special*

Write for New Bulletin

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONNECTICUT

RUGGED POWER

Silky Smooth



GISHOLT
Saddle Type Turret Lathes

Here's how modern Gisholts are geared for greater production—to deliver smooth, vibrationless power—instantly responsive—dependable for years to come. Note these outstanding features:

1 *Gears* . . . Husky headstock gearing will carry all the horsepower and all the load of today's tools, as well as that of the foreseeable future. Rigidity is complete from the massive headstock casting right through to the ground teeth in each gear.

2 *Clutches* . . . Warner Electric Clutches inside the drive pulley do all forward and reverse driving, as well as inching and braking. They never need adjustment and give the smoothest acceleration and braking power ever put on a turret lathe. Instant HI-LO speed changes are obtained at the touch of a finger through hydraulically operated multiple disc clutches.

3 *Bearings* . . . Two precision tapered roller bearings at the front of the spindle, together with the precision ball bearing at the rear, carry all the radial and thrust load you can give them.

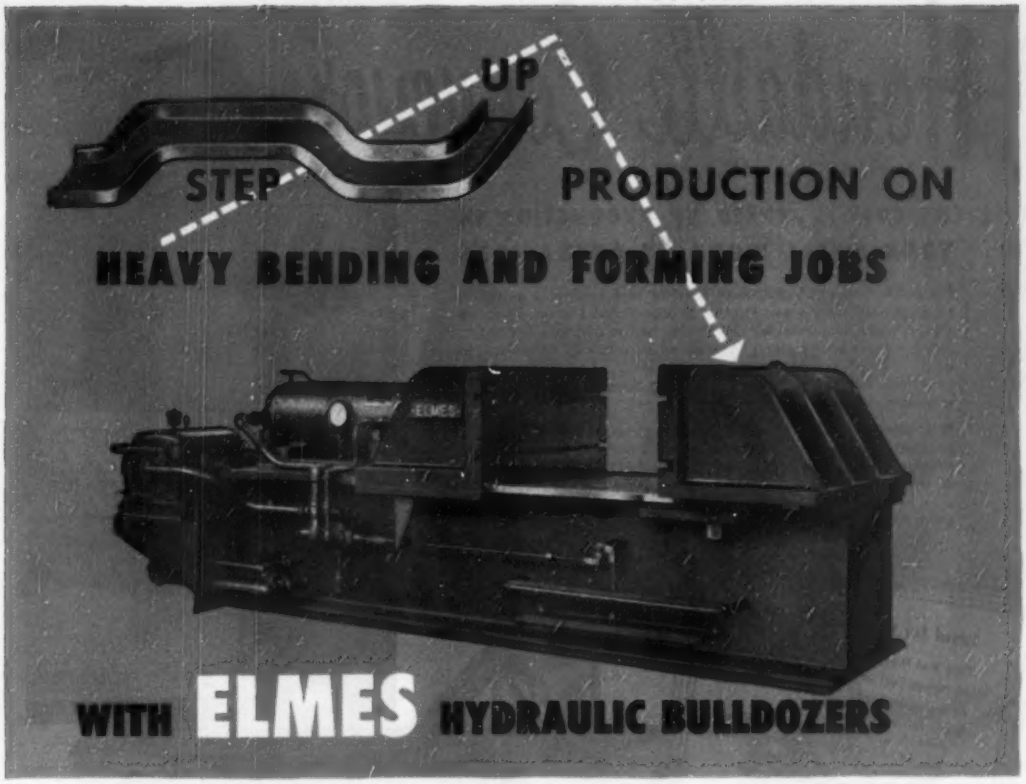
Why not get all the facts? A new bulletin on Gisholt 3L, 4L, 5L Saddle Type Turret Lathes is just off the press. Write for it.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Here is a highly *versatile* Elmes Hydraulic Press that will save you both *time* and *money* on heavy bending and forming operations. The controlled, cushioned squeeze of Elmes hydraulic power eliminates pre-setting or re-setting of press stroke for (1) job changes, (2) variations in stock size. To change jobs—just change dies! Full pressure can be applied at any point in the stroke and length of stroke can be varied to suit the individual job.

Elmes Hydraulic Bulldozers are available in both standard and special designs to meet any capacity requirement. Bed size, stroke and speed are optional to suit your service needs.

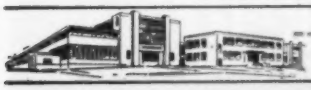
These presses have T-slots in platen and resistance head for mounting dies. Resistance head is adjustable for close-gap work. Other standard features are fixed stop reversal, extra-long removable guides on platen, sensitive tip-toe control, high-speed operation. Pumping unit is located on end of press, for protection against overhead traveling materials.

For nearly a century, Elmes hydraulic equipment has solved the pressing problems of industry. Why not ask Elmes to assist in the selection or design of the right metal-working press for *your* production? Recommendations and cost estimates are yours for the asking!

Write for Bulletin 1010-B, "Hydraulic Metal-Working Presses."

AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION

Distributors in Principal Industrial Centers — *Also Manufactured in Canada*



PLANT **NEW** ADDRESS — 1161 Tennessee Avenue CINCINNATI 29, OHIO

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

Houdaille Conveyor

Write for Case Histories on these typical HOUDAILLE Conveyor installations!

WILL CUT COST . . . SPEED UP PRODUCTION IN YOUR METAL WORKING OPERATIONS

Houdaille Conveyor's automatic loading and continuous materials transport will handle any solid or fibrous material (chips, abrasive sludge, scale, etc.) which will settle to the bottom of a tank or hopper. Many metal working plants have saved substantially on production costs . . . labor, maintenance, down-time, etc. . . . by installing one or more Houdaille Conveyor systems. Look at these important Houdaille advantages:

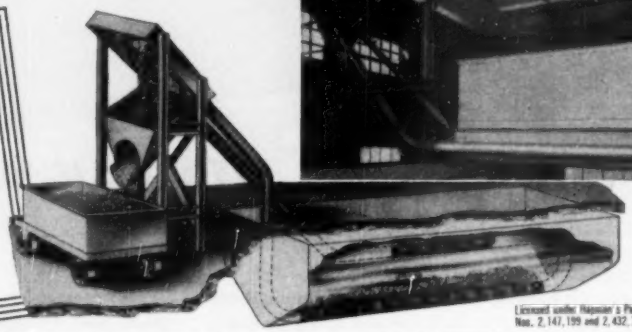
● **Eliminates costly manual handling methods.** ● **Operates continuously or intermittently as needed without shutting down productive machinery** ● **Readily adaptable to almost any space or traverse requirement** ● **Dependable, trouble-free operation . . . requires little or no maintenance attention . . . quickly pays for itself out of savings.**

ABOVE: Houdaille Conveyor for continuous metal chip removal at large motor car plant paid for itself in one year.

BELOW: Houdaille Conveyor for removal of sludge in dust collecting system, Minneapolis Electric Steel Castings Company, saves $1,092 annually.

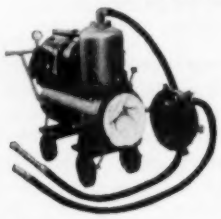
Ideal for Removal of:

Cast Iron Dust and Chips
Aluminum Dust and Chips
Abrasive Sludge
Scale resulting from quenching, metal cleaning, steel rolling, brass rolling, aluminum rolling, wire drawing
Material from Dust Collectors
Plastic Powders
Many Others



Licensed under Hapman's Patents Nos. 2,147,199 and 2,432,756.

Save Time...Save Money with HOUDAILLE "One-Man" Units for Oil and Coolant Filtration and Handling



Houdaille Mobile Coolant Filter

This mobile one-man unit can serve any number of machine tools . . . will clean up an individual machine sump in less than ten minutes. Coolant is drawn through a close-woven cloth bag which removes solid particles such as dirt, chips and abrasives. Clean coolant is returned to the sump.

Houdaille Sump Cleaner

A time saving, one-man unit for removal of cutting oils or coolants contaminated with abrasive, grindings, chips and other solids from machine tool sumps. Equally suitable for cleaning quenching and settling tanks and for draining liquid and chemical vats.

Houdaille Oil Dispensing Unit

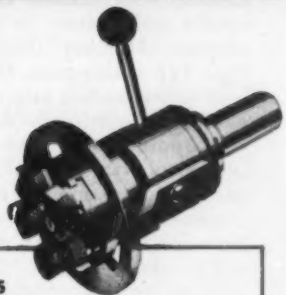
This handy truck is designed primarily to dispense oil from drums to machine tool reservoirs or sumps. May also be used to transfer oil between drums or to remove oils or coolants from tanks for dispensing to machine tool sumps. One man can easily operate the unit and do a fast, clean oil handling job at considerable saving in time and labor.

Write for complete information, specifications and operating details.

HONAN-CRANE CORPORATION 385 SUPERIOR AVENUE, LEBANON, INDIANA

A Subsidiary of HOUDAILLE-HERSHEY CORP.

AND THEY GET 750 PIECES PER GRIND WITH A NAMCO RST TAP



If you want precision threading *fast*, yet economically —then you want the Namco RST Collapsible Tap. Check these features:

ACCURATE—a minimum of parts; fewer to adjust, fewer to wear. Rigid chaser support insures uniform, precision threads.

FAST—quick, positive collapsing at end of cut.

ECONOMICAL—NAMCO ground thread circular chasers are regrindable through a full 270°.

VERSATILE—any type RST tap may be used for either stationary or revolving spindle applications. (For revolving spindle, merely remove handle and replace with solid plate.)

SIMPLE—one screw and collar adjusts all chasers simultaneously to fine diametric setting.

JOB FACTS

Part—Adjusting Nut ⅛" x 4½" O. D.
Material—SAE 1115 Bar Stock.
Machine—Acme-Gridley 5½" RB-4 Spindle Bar Automatic.
Tap—Namco RST, with Ground Circular Chasers.
Thread—3½"—12NF Class 3.
Threading Speed—23 S.F.M.
Pieces Per Chaser Grind—750.
Machine Time—1 Minute 28 Seconds, Day In and Day Out.

Namco RST Collapsible Taps, equipped with blade chasers for thread sizes from 1¼" to 4" and with circular chasers from 3½" to 5", are described in Catalog D-49. Ask for your copy.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids • Centrifuges • Contract Manufacturing

New BAKER

cuts operation time FROM 90 MINUTES TO LESS THAN 5 MINUTES PER PIECE

Boring, reaming, threading and counterboring operations on pipe flanges are accomplished in rapid succession with the new Baker 30H04 Boring and Threading Machine. All four operations are performed with reamer counterbore cutters and chasers in a specially adapted "Murchey" Full Receding Pipe Tap at one pass. Machine has lead screw feeding attachment. The work was previously done with a single point tool with work rotating.

You too, can cut your production costs through *greater productivity.* Consult Baker engineers regarding your specific problem. Replace the old method with a time saving, cost cutting Baker Special Machine.

SINCE 1867 . . .

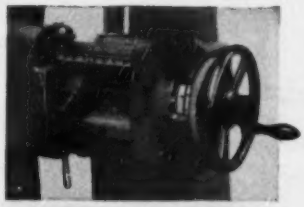
BAKER BROTHERS – Inc. TOLEDO OHIO

DRILLING, TAPPING, KEYSEATING & CONTOUR GRINDING MACHINES

Screw set machine with built-in compensating devices eliminating pitch errors:

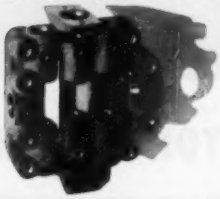
No. 3K JIG BORER

The measuring screws built into the No. 3K Jig Borer for setting the work-table and the spindle saddle to the requisite coordinate location are made of special stabilized steel. They are first tested for lead accuracy in the SIP Metrological Laboratory. Then they are standardized when actually functioning in the machine with reference to a standard scale graduated with the same technique as the line standards supplied by SIP to Bureaux of Standards the world over. All errors are compensated for by automatic correctors, without requiring any attention on the part of the operator.



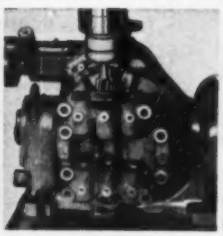
Built-in micrometer heads

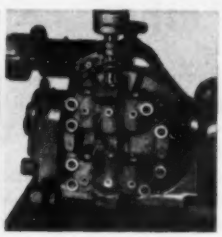
located on the cross-rail and on the machine bed permit direct readings of the spindle saddle and work-table to .00005". They obviate waste of time in the selection and combination of end standards, slip gauges, micrometers, etc. There are no loose instruments to be handled which are liable to be dropped or soiled. The heads are almost totally enclosed and thus protected from injury. The lead screws never come into contact with the operator's hands, thus eliminating temperature changes. The table screw is fully shielded from falling chips, tools and clamps by a suitable cover.

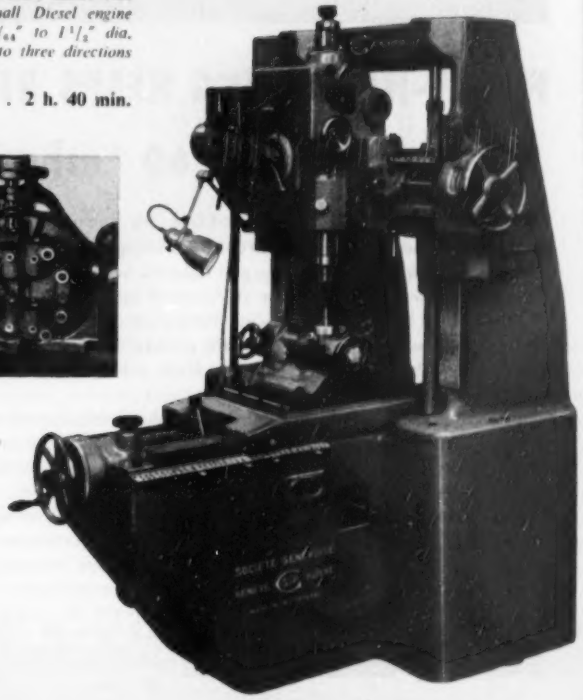


This is a typical job handled on the No. 3K Jig Borer, using the tilting rotary table. This camshaft bearing for a small Diesel engine contains 26 holes from $^{15}/_{64}$" to $1\,^{1}/_{2}$" dia. drilled and bored according to three directions at right angles.

Floor-to-floor time . . . 2 h. 40 min.







SPECIFICATION

Working range	18" × 14"
Table working surface	$20\,^{1}/_{2}$" × 15"
Free distance between uprights	$23\,^{1}/_{2}$"
From table to spindle end — max.	$20\,^{1}/_{2}$"
Spindle speeds	75 to 2000 r.p.m.
Boring capacity, dia.	4"
Spindle quill travel	6"
Net weight	3700 lbs

Guaranteed accuracy

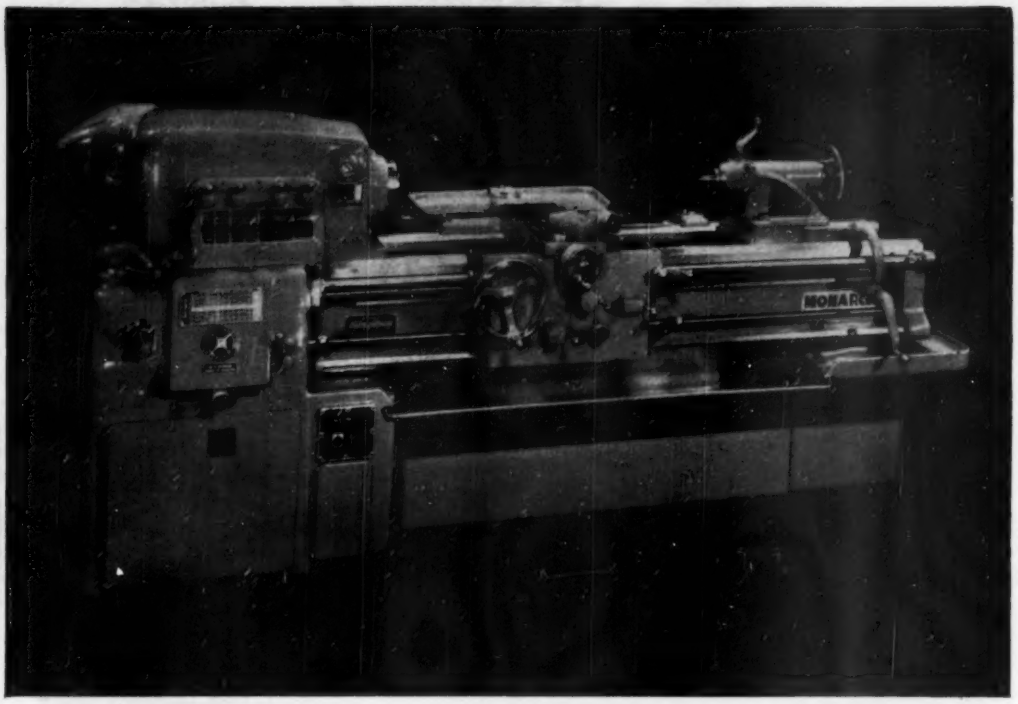
FOR ALL SETTINGS OF WORK-TABLE AND SPINDLE SADDLE: .0002 in.

SIP

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.



FLAME-HARDENING KEEPS BEDWAYS FACTORY-FRESH

—on Series 60 Lathes

The famous Flame-Hardened and Ground Bedway is an exclusive process, pioneered by Monarch. This important construction feature, proved in use on both the carriage and tailstock bedways of more than 25,000 Monarch Lathes, is standard for all Series 60 machines.

As indicated by the accompanying illustration of a typical bedway section, this process results in a surface with the uniform hardness properties of steel, integral with the softer bed metal. The result is longer life and the preservation of original in-built accuracy.

This same principle of insuring factory-fresh precision is evidenced in every moving part of the Series 60 machines. All gears and other parts subject to wear are made of steel; then hardened by the best possible method, including induction hardening.

These and many other design and construction advantages found in Series 60 lathes mean longer life and more savings through lowered operating and maintenance expense. For complete information on these outstanding machines, available in 14", 16" and 20" sizes, ask for Booklet 1113.

Section of Monarch Flame-Hardened Bedway

You'll Save on Maintenance and Operating Expense With These Series 60 Features:

1. Totally-enclosed gearbox and end gearing—preserves accuracy.
2. Automatic pressure lubrication—insures long life at original efficiency.
3. All anti-friction bearings—for peak power and less maintenance.
4. Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting.
5. American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting.
6. Flame-Hardened and Ground Bedways—preserves accuracy—proved on over 25,000 Monarch Lathes.
7. Induction hardening of many critical parts—for long, trouble-free life.

ACCURACY · ECONOMY · LONG LIFE

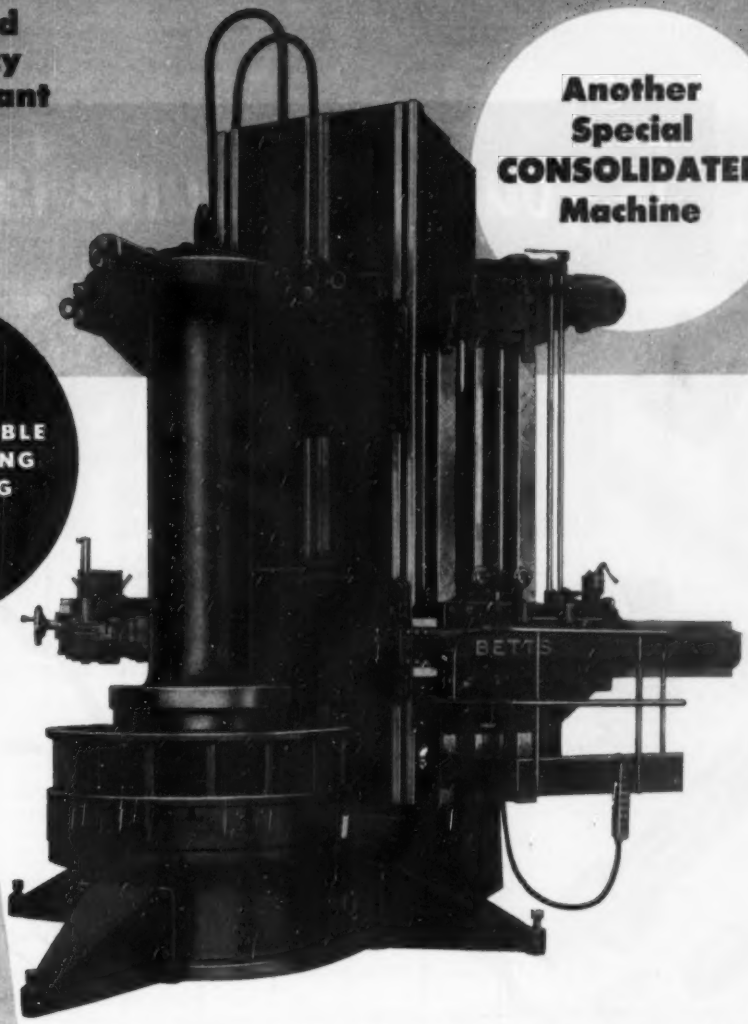
Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

When time and closest accuracy are all-important

Another Special CONSOLIDATED Machine

BETTS SPECIAL PORTABLE TURNING, FACING AND DRILLING MACHINE



Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

This Betts Portable Turning, Facing and Drilling Machine is a specialized tool designed for machining the journals and flanges of water wheel shafts of hydro-electric generators—IN THE FIELD. With this mobile arrangement, when such repairs are necessary, the work is done right in the generating station where this machine meets two extremely important requirements. First, it eliminates the costly down-time ordinarily consumed in transporting the shaft back and forth between the generating station and the factory. Secondly, it provides the means for producing the high degree of accuracy imperative for this important part.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

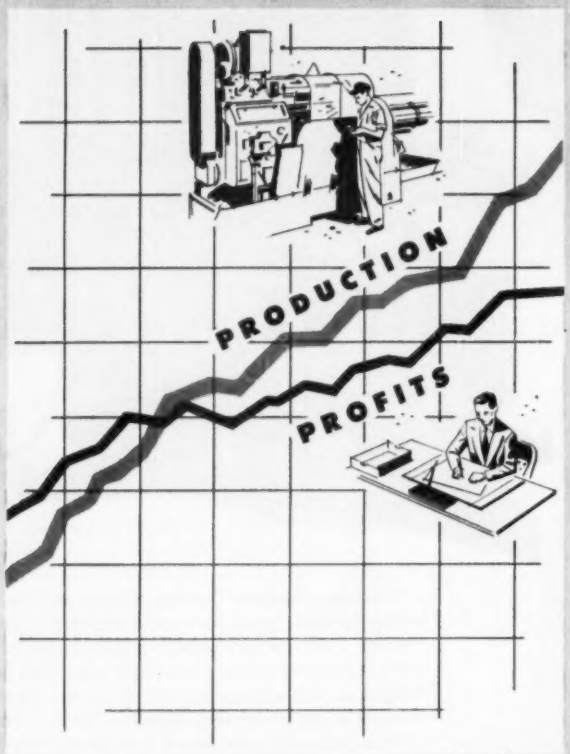
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Is your Profit Curve lagging



THIS NEW STEEL
MAY HELP YOUR PROFIT CURVE, TOO!

Are your equipment and parts such that you can use higher speeds and longer tool life? Then it will pay you to investigate Union Drawn's new Bessemer Screw Steel —B-1113-X. A Union Drawn Metallurgist will be glad to tell you all about it.

behind your Production Curve?

. . . maybe it needs this improved

MACHINABILITY

● It sometimes happens! A robust parts production curve climbs steadily . . . but in spite of every remedy at hand, the profit curve develops anemia—just doesn't have the stuff to make the grade.

Is *your* profit curve as healthy as it might be? Maybe *it* needs the same "shot in the arm" that has helped other parts producers—the kind of MACHINABILITY that has made Republic Union Cold Drawn Steels famous.

Yes, famous—and for very good reasons! At Union Drawn the first and foremost aim of metallurgists and engineers always has been MACHINABILITY—*uniform* MACHINABILITY.

Little wonder, then, that these men know so much about this vital factor in the mass production of steel parts . . . and how to produce steel bars that cut equally well whether shipped today, next week or next year.

If you've never used Republic Union Cold Drawn Steels, here's what you can expect: 1. Uniformity throughout bar after bar and shipment after shipment. 2. A remarkable freedom from tool-wearing abrasive elements. 3. Smooth, bright machined surfaces. 4. Top production efficiency. 5. Low unit costs. All of which stimulate the profit curve.

Now—how to apply all this to your own operations to get the most out of it? Just ask us to put Republic metallurgists and engineers to work for you. It's their job to see that you use the right steel in the right way—to help you get that profit curve back up where it belongs. Call your nearest Republic District Sales Office—or write us.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, New York

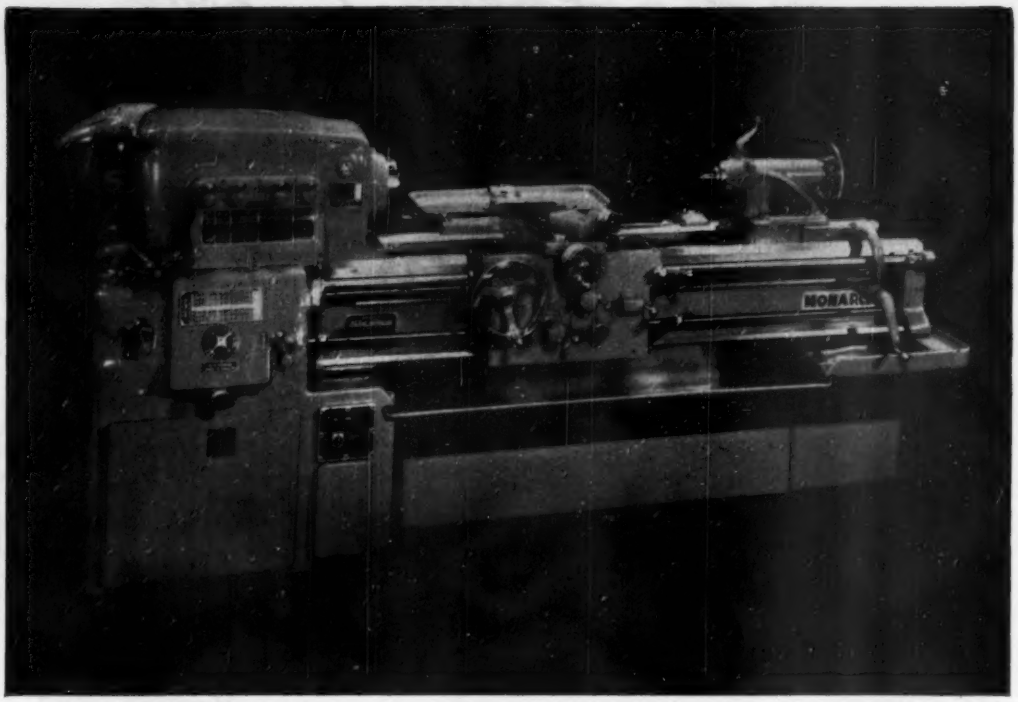
Republic

REPUBLIC STEEL

US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)



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—on Series 60 Lathes

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These and many other design and construction advantages found in Series 60 lathes mean longer life and more savings through lowered operating and maintenance expense. For complete information on these outstanding machines, available in 14″, 16″ and 20″ sizes, ask for Booklet 1113.

Section of Monarch Flame-Hardened Bedway

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3. All anti-friction bearings — for peak power and less maintenance.
4. Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting.
5. American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting.
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ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

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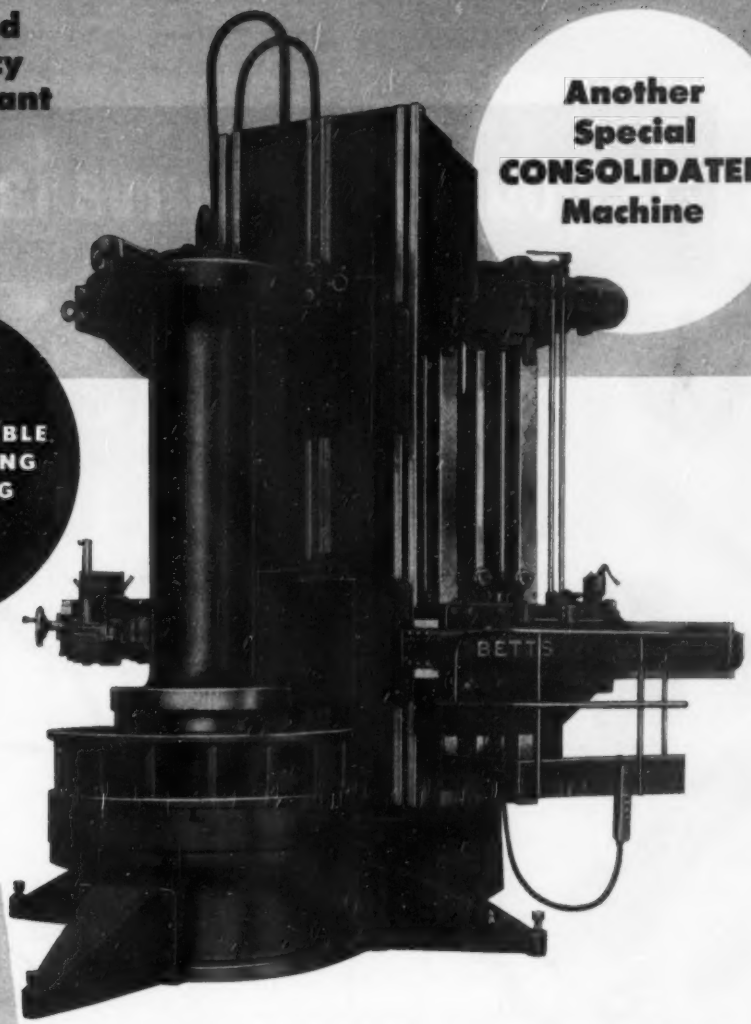
When time and closest accuracy are all-important

Another Special CONSOLIDATED Machine

BETTS SPECIAL PORTABLE TURNING, FACING AND DRILLING MACHINE



Among Heavy Machine Tools built by Consolidated are . . . .

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BORING MILLS
DRILL PRESSES
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COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

This Betts Portable Turning, Facing and Drilling Machine is a specialized tool designed for machining the journals and flanges of water wheel shafts of hydro-electric generators—IN THE FIELD. With this mobile arrangement, when such repairs are necessary, the work is done right in the generating station where this machine meets two extremely important requirements. First, it eliminates the costly down-time ordinarily consumed in transporting the shaft back and forth between the generating station and the factory. Secondly, it provides the means for producing the high degree of accuracy imperative for this important part.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

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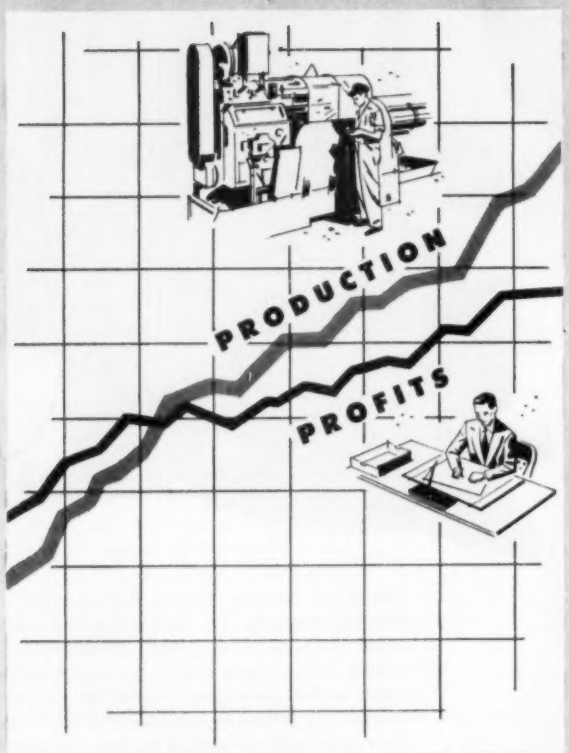
Is your Profit Curve lagging



THIS NEW STEEL
MAY HELP YOUR PROFIT CURVE, TOO!

Are your equipment and parts such that you can use higher speeds and longer tool life? Then it will pay you to investigate Union Drawn's new Bessemer Screw Steel —B-1113-X. A Union Drawn Metallurgist will be glad to tell you all about it.

behind your Production Curve?

. . . maybe it needs this improved

MACHINABILITY

● It sometimes happens! A robust parts production curve climbs steadily . . . but in spite of every remedy at hand, the profit curve develops anemia—just doesn't have the stuff to make the grade.

Is *your* profit curve as healthy as it might be? Maybe *it* needs the same "shot in the arm" that has helped other parts producers—the kind of MACHINABILITY that has made Republic Union Cold Drawn Steels famous.

Yes, famous—and for very good reasons! At Union Drawn the first and foremost aim of metallurgists and engineers always has been MACHINABILITY—*uniform* MACHINABILITY.

Little wonder, then, that these men know so much about this vital factor in the mass production of steel parts . . . and how to produce steel bars that cut equally well whether shipped today, next week or next year.

If you've never used Republic Union Cold Drawn Steels, here's what you can expect: 1. Uniformity throughout bar after bar and shipment after shipment. 2. A remarkable freedom from tool-wearing abrasive elements. 3. Smooth, bright machined surfaces. 4. Top production efficiency. 5. Low unit costs. All of which stimulate the profit curve.

Now—how to apply all this to your own operations to get the most out of it? Just ask us to put Republic metallurgists and engineers to work for you. It's their job to see that you use the right steel in the right way—to help you get that profit curve back up where it belongs. Call your nearest Republic District Sales Office—or write us.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, New York

Republic

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US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

Here are American

Quality Springs *in Action!*

● Springs are the very heart of most toys for children. But what a beating they have to take.

Toy springs are wound to the limit, countless times a day. They're *overwound*. Even wound *backwards*. All but the best springs give mighty short service.

We make these rugged springs for many toy companies . . . and they stand up. But that's not all we do. American Steel & Wire makes springs for locomotives, alarm clocks, tractors, typewriters—everything, in fact, that needs good springs . . . well designed . . . carefully manufactured.

Take advantage of our wide experience, our unequalled research and testing facilities, our most modern production equipment. For expert engineering assistance and further information, write: American Steel & Wire Company, Rockefeller Building, Cleveland 13, Ohio.

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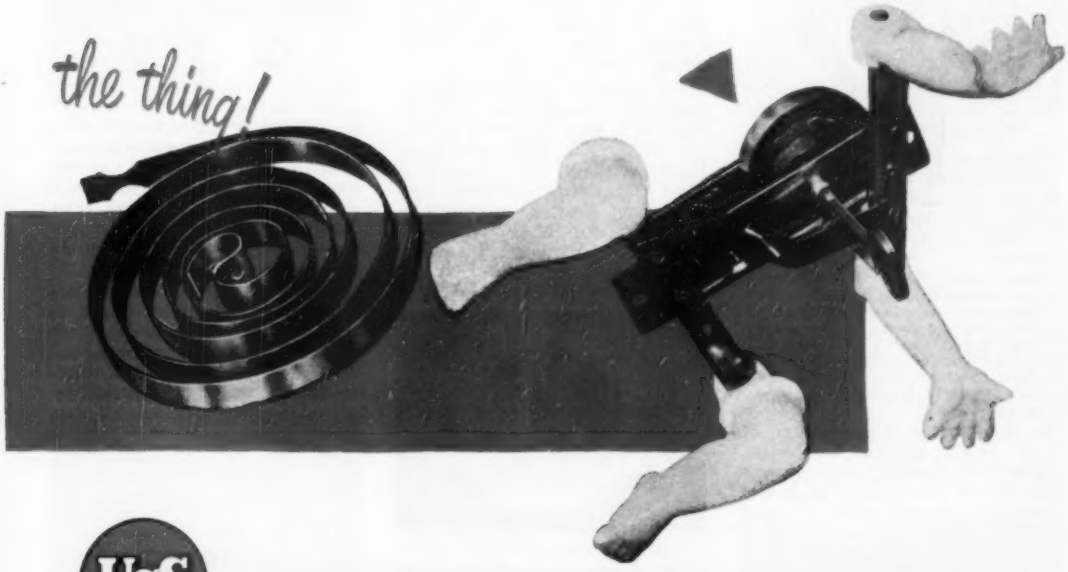

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AMERICAN QUALITY SPRINGS

UNITED STATES STEEL

ADVERTISEMENT

Composite Hack Saw Blade Has Many Advantages

for both Production and Occasional Sawing

Metal Sawing was tedious and inefficient at the turn of the century. While power hack saws were in use, they merely eliminated the drudgery of hand sawing, for they could not bring to the operation the cost saving factors of multiplied cutting force and high cutting speeds. This was because the hack saw blades of that day quickly annealled and lost their cutting edge under temperatures generated by metal sawing at any speed much above that of hand sawing or with feed pressures beyond the light feeds used to "scratch" away metal.

With the development of High Speed Steel half of the problem was solved. Here was the ideal cutting agent that readily cut every machinable metal, that did not soften and would withstand the temperatures developed. Further, this new steel held its edge many times as long as any previous blade steel. However, being extremely hard, this steel was inherently brittle.

"extremely hard ** inherently brittle"

Though it offered ideal cutting characteristics, it also literally exploded (shattered like plate glass) under even a normal cutting load, as blades were but thin strips of this metal.

Even today, after a quarter century of additional metalurgical research, with closely controlled heat treating processes, few solid high speed steel blades last to deliver more than a percentage of their theoretical cutting life before shattering, and then only when "babied".

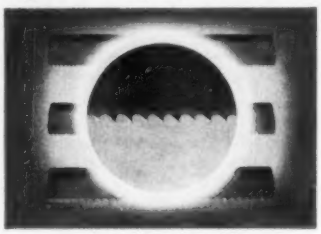
As the leading manufacturer of power hack sawing machines, MARVEL assigned its engineers the task of developing a hack saw blade that would stand up under cutting speeds, feeds and working temperatures comparable with those attained on other types of machine tools. All available steels were tested for cutting quality, load carrying ability, and resistance to shock. While alloys of great tensile strength and toughness were found, they were invariably poor in cutting quality in almost directly proportional ratio to their ability

"years of research, tests and refinement"

to withstand load and shock. The characteristics needed were diametrically opposite. It was like seeking a steel that could be both white hot and ice cold at the same instant.

The solution of this problem, and the beginning of all really efficient metal sawing, came when MARVEL Engineers gave up the "alchemists' dream" of finding a single metal that would combine the diametrically opposed characteristics needed and started on the development of a *bi-metal* hack saw blade as the only way to combine in one blade both the fastest cutting, longest lasting cutting edge, and great strength and toughness.

Many additional years of research, experiment, development, tests and refinement were required to perfect the MARVEL High-Speed-Edge Hack Saw Blade, and to design and build the special machines, processes and plant to manufacture them. In 1926 MARVEL introduced this composite blade, in which a high speed steel cutting edge was integrally welded to a



"a marriage of metals"

tough chrome-vanadium alloy steel body. This "marriage of metals" in the MARVEL High-Speed-Edge Hack Saw Blade produced a positively unbreakable blade with the longest-lasting, fastest-cutting edge, and strength to withstand the heaviest feed pressures.

Before the advent of the MARVEL High-Speed-Edge Hack Saw Blade, run-outs (inaccurate cutting) were prevalent too, because the ends would pull out before any blade could be sufficiently tensioned. Blades were of many type names and classes. Blade failures were blamed on "the wrong blade for the job," and the MARVEL statements of "one superior blade for all machinable metals" and "positively unbreakable under any attainable speed or feed," was so unbelievable that it had to be literally proven by demonstration, shop by shop.

The MARVEL High-Speed-Edge Blade, with its tremendously strong body permitted the development of the first truly high speed sawing machines, the all-ball-bearing heavy duty hack saws, the first high speed, automatic production saws, and

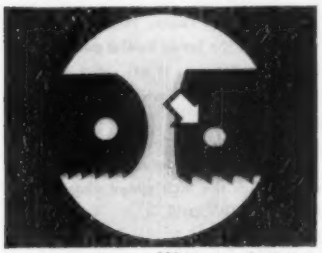
"cutting tool, can't be too rigid"

finally, the giant hydraulic hack saws, culminating in the supergiant hydraulic hack saw with 24″ x 24″ capacity. Metal sawing costs dropped proportionately and became an efficient and accurate operation.

With increased application, a science of metal sawing developed and, as always, when the market is divided between the "haves and the have nots," there has been much contention as to the factors involved in sawing efficiency. Today, there is much argument as to what constitutes "sufficient" blade tension. MARVEL believes that a hack saw blade, like any other cutting tool, cannot be too rigid (tensioned too tight) in its holder or frame; that a loose cutting tool in a hack saw, milling machine, lathe, or other machine tool cuts inaccurately and will chatter. Due to their composite construction, the load-carrying has been raised to the

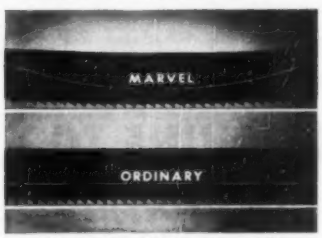
point where MARVEL High-Speed-Edge Hack Saw Blades can be tensioned from 200% to 300% tauter than any one-piece, solid blade can be tensioned without danger of pulling out its ends. MARVEL Blades are *unbreakable* and that statement also definitely covers that common weakness in all one-piece blades. It seems obvious that any limit on tensioning places a related limit on feed pressure, and hence on the output of any machine.

MARVEL Engineering revealed another neglected factor in good metal sawing — the location of the pin holes by wh.ch the blade is held in the saw frame. These gripping holes provide the sole means for transferring tension to a saw blade. Standard practice places these holes in the center of the blade ends.



"another difference *** location of holes"

MARVEL engineering established that with centered holes, the equi-tension along the center line of the blade between the holes and across the entire width of the blade *before* the blade entered the work, was destroyed the instant the blade contacted the work. The combination of horizontal tension and vertical pressure (work resistance) formed a "tension arc" patterned from one pin hole upward to the top of the blade midway between pin holes and down to the other hole. This rainbow-like stress tends to create a nil tension condition at the leading or cutting edge of the blade.



"tension before blade enters work"

"MARVEL has a straight edge in the work"

In MARVEL High - Speed - Edge Blades, the clamping pin holes are placed well below the vertical center of blade ends—are as close to the cutting edge as is practical. As a result, the 200% to 300% greater working tensions of MARVEL Blades are confined to the lower, working one-third of the blade before it enters the work. Though parallel conditions to those with other blades are set up under identical operations, with the MARVEL Blades work resistance does not wholly overcome tension and the leading edge is taut *at all times*.

Also, with tension holes below center, a MARVEL blade becomes slightly convex when tightened in a saw frame. Blades with centered pin holes are straight, due to equi-tension across the entire breadth. *But*, when work resistance is encountered, the flex of the blade is naturally greatest in the unsupported center section. Consequently, MARVEL has a straight cutting edge *in the work*, whereas others become concave, overloading the end teeth sections. These features permit higher speeds and heavier feeds with accuracy, because they lessen the tendency of the blade to wander. The pin hole areas of MARVEL High - Speed - Edge Blades are also hardened by an additional process to eliminate elongation and loss of essential tensions.

The contour of every tooth in each MARVEL High-Speed-Edge Blade is identical to the nth degree. This is an exclusive feature, made possible only by MARVEL'S highly technical and exclusive method of forming the teeth. The special machines which perform this operation were designed and built by MARVEL engineers in the MARVEL plant and are without duplicates. This absolute uniformity of teeth produces a faster cutting blade with superior chip elimination from the kerf.

Following rigid tests and meticulous inspection of every blade, *each* is individually enveloped for continuous protection until it is ready

"each tooth identical to the nth degree"

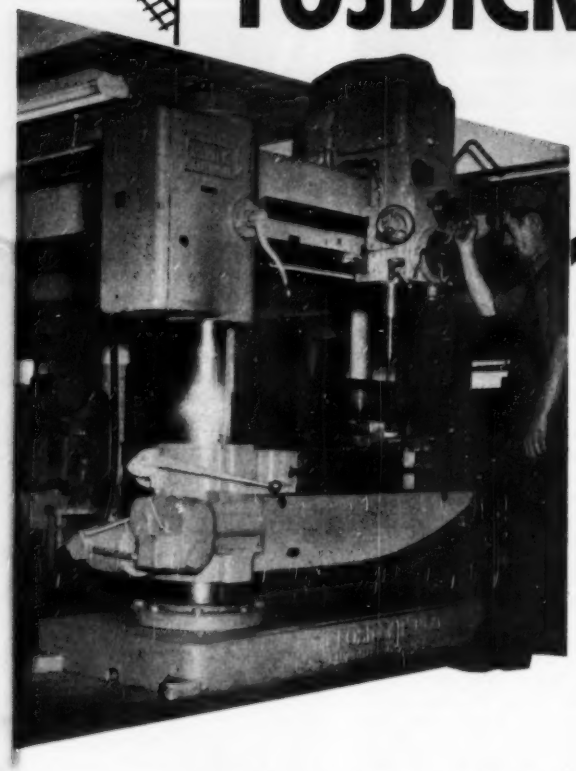
to be put to end use. It is a certainty that all cutting tools should be afforded the utmost care to prevent dulling or set wear before use, and this is borne out by the fact that files, taps, and other similar tools are all individually wrapped, as are MARVEL High-Speed-Edge Hack Saw Blades. After enveloping, ten blades are boxed in the standard package — not dozens — and these two features are also originally MARVEL.

"in individual envelopes — 10 to the box"

Bulletin ST650 gives complete specifications and price information on all MARVEL High-Speed-Edge Hack Saw Blades as well as MARVEL High-Speed-Edge Hole Saws, the latter incorporating many of the construction details of the blades. Ask for it as the first step in the reduction of cut-off costs. Write Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago 39, Ill., U.S.A.

Fits right into your Production Scheme

FOSDICK Sensitive RADIAL



This shows a Fosdick Sensitive Radial in operation at the Borden Mills Plant, Kingsport, Tenn. You'll find them saving time and costs in plants all over the country from Maine to California, and from Canada to Texas.

• • •

Our new bulletin gives all the details of construction and fully describes its modern features. Write for the Fosdick Sensitive Radial Bulletin S. R. A.

Because of its high utility factor this machine fills the gap between the large Radial and the Sensitive and Upright Drills. It fits right into the production scheme of both large and small shops.

It has the sturdy construction and flexibility of Radial design plus the high speed characteristics of the Sensitive Drill.

The heavy base construction—the one-piece column—and the adjustable swinging table assure unusual rigidity for sensitive drilling operations. The arm is at a fixed height within easy reach of operator on all jobs. Both table and arm swing in an arc of 360°.

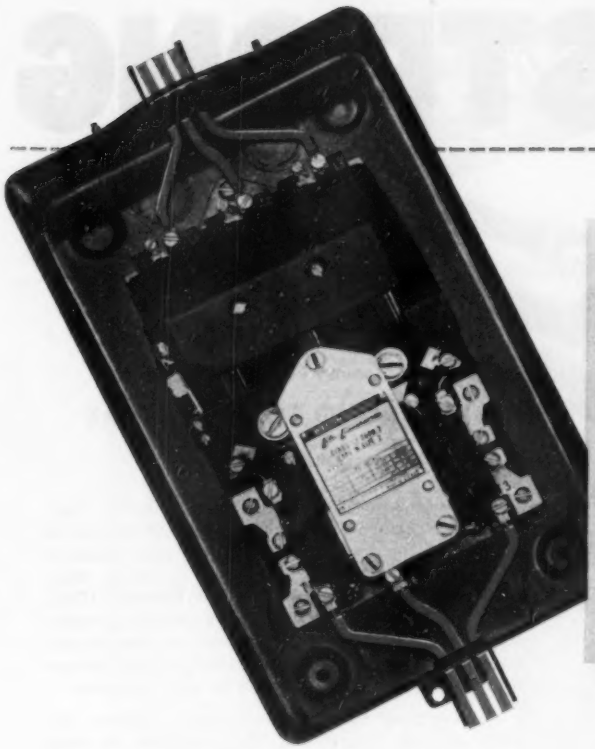
The nine speeds and four feeds are controlled by means of direct reading levers on the head. Thus all operating feeds and speeds are easily attained from the operator's normal working position.

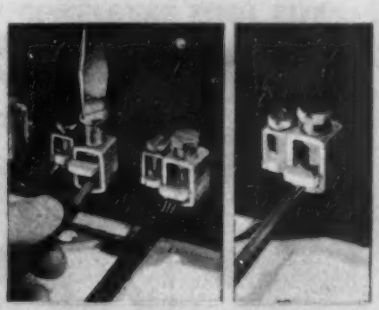
This comparatively new machine is finding its way into hundreds of plants where there are small pieces requiring a number of holes to be drilled. Perhaps it will fit into your production scheme at a cost that is surprisingly low.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

YOU CAN BE **SURE**.. IF IT'S

Westinghouse





PRESSURE-TYPE CONNECTORS

STRAIGHT-THROUGH WIRING

NEW Life-Linestarter*

cuts installation costs 4 ways!

Savings start before they are put in operation . . . with the new Westinghouse Life-Linestarter. New design features permit faster, easier installation—

1. **Straight-through Wiring**—Plainly marked line terminals are *all* at top—load terminals *all* at bottom, permitting simple, straight-through wiring with uniform lead lengths. All terminals are easily reached from the front.
2. **Pressure-type Connectors** speed the job and provide a positive low-resistance connection for either solid or stranded conductor, in a range of sizes to cover all ratings.
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The Life-Linestarter cuts costs in other ways, too—uniformity and completeness of line (NEMA sizes 0 through 4, to 100 hp, 600 volts) . . . superior performance . . . positive protection. Ask your Westinghouse representative to show you "the inside story"—a Trans-Vision presentation. Or write for booklet B-4677. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-30025

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Life-Linestarter

TOMORROW'S STARTER—TODAY!

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Modern Tooling Calls for the Correct

ARMSTRONG TOOL HOLDERS

for each operation

In the old days it was a matter of pride with toolmakers to be able to do the work at hand with the tools at hand. It's a credit to their skill that they could devise to cut threads, do cutting-off and facing, as well as many other operations with one ARMSTRONG TURNING TOOL, but, at today's labor cost, this would be an expensive practice. The maximum of productive work and true machining efficiency can only be obtained by providing the correct ARMSTRONG TOOL HOLDERS for each operation.

The Armstrong System of Tool Holders provides specially designed ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers . . . Turning Tools, Boring Tools, Threading Tools, Knurling Tools, Cutting-Off Tools; tool holders with straight shanks, with off-set shanks, rigid tools and "spring" tools . . . special tool holders for high speed steel bits or blades, for ARMIDE (carbide-tipped) Cutters, for ARMALOY (cast alloy) Bits and Blades.

These modern efficient ARMSTRONG TOOL HOLDERS are as available as your telephone for they are carried in stock by your local ARMSTRONG Distributor.

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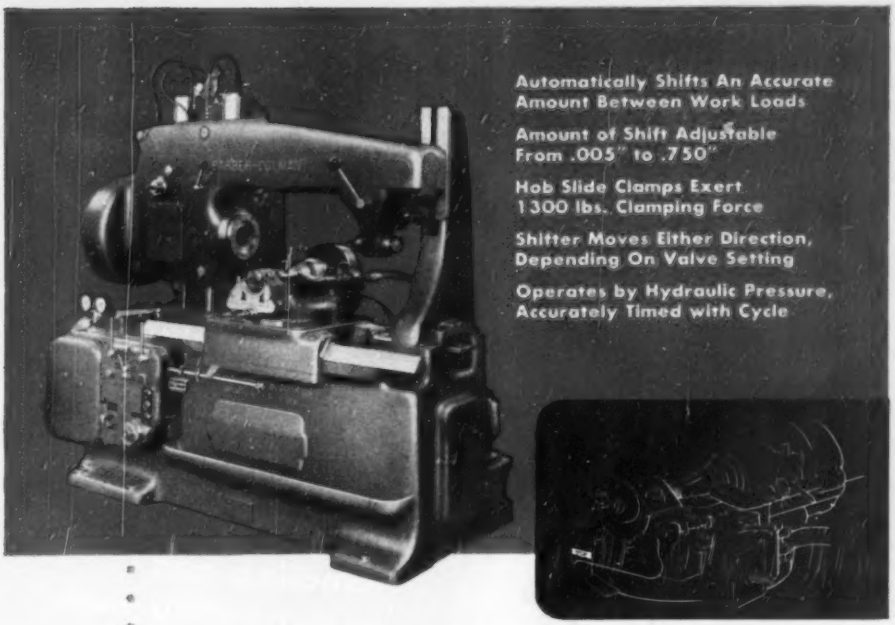
AUTOMATIC HOB SHIFTING
on no. 14-15 hobbing machine

NEW SHIFTER CONSERVES TOOL LIFE
HOBBING COARSE PITCH GEARS


Automatically Shifts An Accurate Amount Between Work Loads
Amount of Shift Adjustable From .005" to .750"
Hob Slide Clamps Exert 1300 lbs. Clamping Force
Shifter Moves Either Direction, Depending On Valve Setting
Operates by Hydraulic Pressure, Accurately Timed with Cycle

Automatic Hob Shifting featured on Barber-Colman No. 8-10 and No. 16-16 Hobbing Machine is now available on the No. 14-15 machine.

The new No. 14-15 Automatic Hob Shifter is operated by the hydraulic pressure of the machine, and timed to move the hob slide a pre-determined amount after each cycle. Wear is evenly distributed over all of the hob teeth and average floor-to-floor time for the work piece is reduced.

Field reports indicate that Automatic Hob Shifting produces as much as *50% increase in hob life,* as well as improved gear tooth accuracy and finish. These advantages are now offered in the field of coarse pitch gear hobbing, through Automatic Shifting on the No. 14-15 Hobbing Machine.

Get Additional Data Free—
For detailed description of the shifter and Mapi Analysis of the economics of Automatic Hob Shifting, send for Hobbing Notes No. 6136.

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"100% increase in machinability at 300 Brinell"
"easy drilling and tapping at 340 Brinell"
Heres what users say about
U·S·S Carilloy FC
free-cutting alloy steel
"lower handling and heat-treating costs"
"lowered over-all costs"
"has increased production"

free-cutting Alloy Steel

U·S·S Carilloy FC

AVAILABLE QUENCHED AND TEMPERED, FROM 255 TO 375 BRINELL

DO you manufacture heavy-duty shafts, gears, axles or other heavily-stressed parts that demand high hardness and strength? If you do, Carilloy FC steel can end a lot of your heat-treating and machining headaches.

U·S·S Free-Cutting Carilloy FC is a deep hardening Mn-Cr-Mo steel, already quenched and tempered to the hardness you require. You don't have the expense of heat-treating after machining, and you eliminate rejects caused by distortion and scaling.

Users of Carilloy FC steel say that it increases tool life remarkably. Life increase figures go as high as 300% . This substantial savings in tool cost, coupled with the often marked savings in production time, adds up to an over-all reduction in costs that's hard to beat with *any other steel* that has comparable hardness and strength.

U·S·S Free-Cutting Carilloy FC is available in bar form, quenched and tempered *or* annealed, in all sizes of rounds from 5/8" to 8-1/8" diameter.

Here's the clincher: Carilloy FC steel costs only a *fraction of a cent* more per pound than ordinary, thorough-hardening alloy steels. If your job requires forging, we can also furnish a complete range of Hot Rolled Bar and Semi-Finished sizes.

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

Carnegie-Illinois Steel Corporation
Room 2165 Carnegie Bldg., Pittsburgh 30, Pa.

Please have a representative call to discuss U·S·S Free-Cutting Carilloy FC.

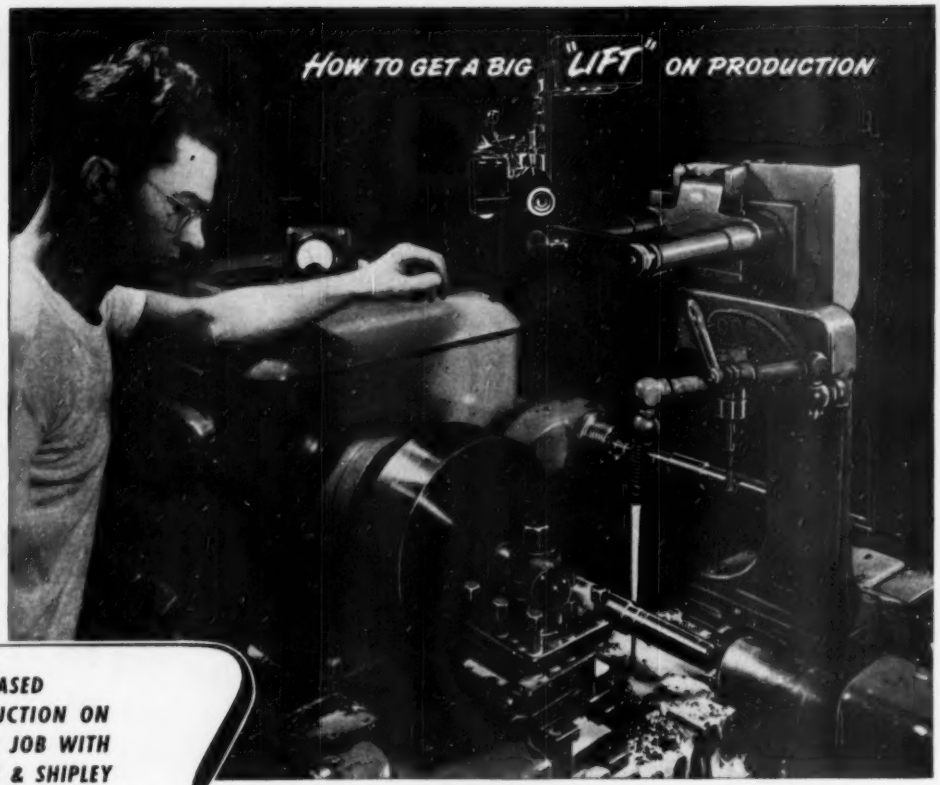
Name .....

Company .....

Address .....

City ..... Zone ..... State .....

UNITED STATES STEEL



"INCREASED PRODUCTION ON EVERY JOB WITH LODGE & SHIPLEY COPYMATIC LATHES" ... REPORTS AUTOMATIC TRANSPORTATION COMPANY

NOTED FIRM CUTS TURNING TIME... 55%

"Outstanding on production work" says this noted firm, reporting on COPYMATIC Lathe performance in their Chicago plant.

In the photo, an armature shaft of heat-treated SAE 4140 steel is being rough and finish turned, thread relief cut and chamfered. The former method took this firm 14.09 minutes; on the COPYMATIC, it's only 6. 3 minutes. This and other operations show comparable savings . . . as much as 55% in time alone!

This is NOT an unusual example of profitable operation. Actually, EVERY owner finds his Lodge & Shipley COPYMATIC Lathes cut production time 30 to 70%.

Instant changeover—from regular lathe operation to automatic tracer controlled duplication, from round or flat templates—take the COPYMATIC out of the "special machine" classification.

COPYMATIC'S are profitable producers for 'most any size shop. For the complete story, write for Bulletin No. 675 and production performance records.

THE Lodge & Shipley COMPANY
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CINCINNATI 25, OHIO

how to bring
CUTTING COSTS DOWN

SWITCH TO CIMCOOL°, and watch those cost figures go down—way down. For this revolutionary cutting fluid—this *chemical emulsion*—saves you money three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its *chemical lubricity.*
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also reduces down-time, cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

We honestly believe that one week's run will convince you. And we'll be glad to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, write for our free booklet "Cimcool Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

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THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

COATED PRODUCTS COMMENTS

Where conventional belts fail...use new, improved Resin Industrial Cloth

In applications where conventional glue-bonded belts are seriously weakened by intense frictional heat, you now can get outstanding service from CARBORUNDUM'S *new improved* Resin Industrial Cloth Belts.

Because these belts successfully resist the damaging effects of frictional heat, more units can be ground per belt... fewer belt changes are required... production time is saved. This effects substantial cost reductions while, in many cases, output is more than doubled.

Product quality is improved and rejection losses are cut. Finished articles have far fewer surface imperfections due to discoloration, burning, checking, cracking and distortion.

CARBORUNDUM'S *new improved* Resin Industrial Cloth Belts are especially effective on backstand belt grinders, centerless belt grinders, flat belt stroke sanders, swing frame grinders and platen type belt sanders which are not equipped with liquid coolant systems. Coated Products Division, The Carborundum Company, Niagara Falls, New York.

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NEW . . . POWERFUL

TOOL ROOM and PRODUCTION

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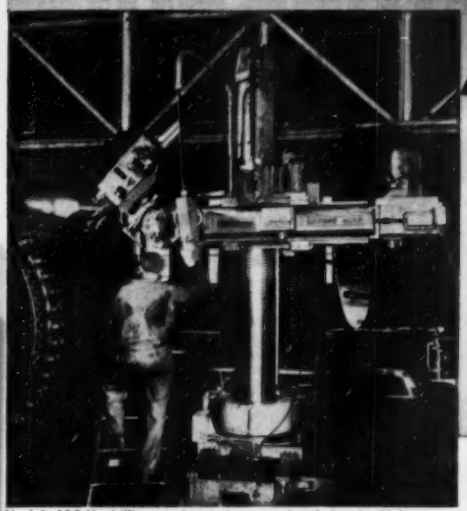
Kaukauna DRILLING and TAPPING Machines

UNIVERSAL AND HORIZONTAL

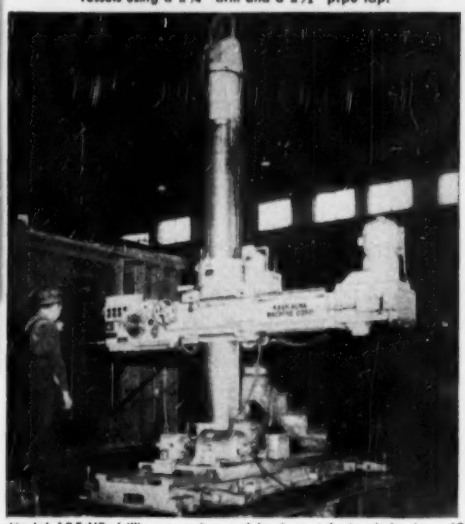


Model 125-U drilling and tapping angular holes in high pressure vessels using a 2¾" drill and a 2½" pipe tap.

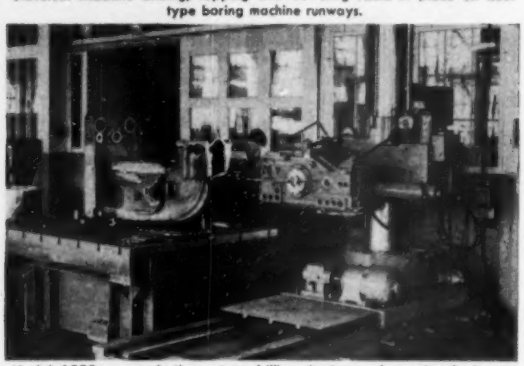
PROFIT FROM ANGULAR, VERTICAL AND HORIZONTAL OPERATIONS WITH 1 SETUP

Almost any casting or weldment—of almost any size and shape—can be drilled, tapped or spot-faced in any location accurately, quickly and easily with a KAUKAUNA Machine. Furnished with Universal Head with compound swivels, Tilting Head or Horizontal Head, all with 360° column swivel. Horizontal traverse on runway and vertical traverse on column to suit requirements. For portable or fixed location use.

Universal Machine drilling, tapping and doweling racks in place on floor type boring machine runways.



Model 125-HR drilling, reaming and back spot facing holes in a 40 cu. yd. bucket.



Model 1030 on production setup, drilling, boring and tapping horizontal holes in milling machine bases, columns, headstocks and tables.

Cut your costs on setup time, crane time, fixturing and machine hours. ***Write for Catalog.***

KMC

Kaukauna MACHINE CORPORATION KAUKAUNA, WISCONSIN

General Distributors: **Bryant Machinery & Engineering Company**

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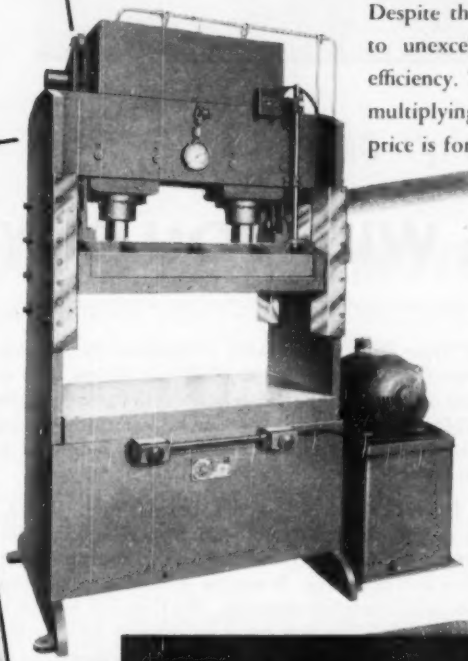
famous for PUSHING DOWN COSTS

Take a look at the records—the records of KRW Presses that are doing your kind of work. They all point up a proven way to push down mounting production costs. Despite their low price tag they are built to unexcelled standards of quality and efficiency. That's why they are famous for multiplying profits long after the purchase price is forgotten.



HIGH LIGHT Specifications of TOP FLIGHT Quality Features

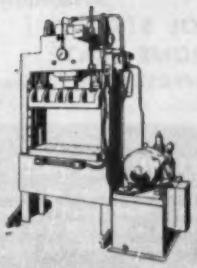
Heavy steel plate construction. Precision honed cylinders. Adjustable tonnage pressure control. Adjustable limit switch for top return position of ram. Safety by-pass over-loading beyond maximum rated capacity. Large self-contained oil reservoir. Direct connected motor drive to pumps through easily serviced flexible couplings. Safety controls prevent accidents. Long bronze faced gibs adjustable for wear insure accurate travel of slide. Quiet and vibrationless in operation. Presses can be custom built to meet your manufacturing requirements. Write or wire for full facts and low prices.

TWO CYLINDER TYPE — Tons capacity: 60, 85, 100. Platen and bolster, maximum usable size: F to B, R to L, 36" x 60". Stroke: 6", 11". Bed, fixed. Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.

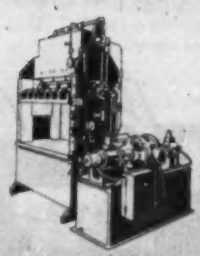
K·R·WILSON

215 MAIN ST. BUFFALO 3, N. Y.

ONE CYLINDER TYPE— Tons capacity: 25, 50, 75, 100, 125, 150. Platen and bolster, maximum usable size: 24" F to B, 36" R to L. Stroke: 6", 11", 18". Bed adjustment: increments of 6". Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.



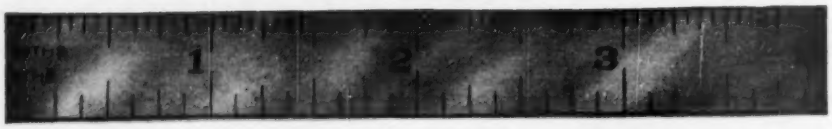
THREE CYLINDER TYPE Tons capacity: 75, 100, 125, 150. Platen and bolster, maximum usable size: F to B, R to L, 48" x 72". Stroke: 6", 11". Bed: fixed. Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.



KRW PRESSES — are self-contained and fabricated of steel for maximum strength, minimum weight and space conservation.

Van Keuren WIRE TYPE PLUG GAGES

VAN KEUREN FULL 2" GAGE



AGD 1¼" GAGE

WHICH GAGE WILL YOU BUY?

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co. It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies are now free upon request.

Wire Type Plug Gages were originated by The Van Keuren Co. over 25 years ago. In 1948 this design was adopted in shorter lengths as the AGD standard for gaging holes from .030" to .510" diameter. The Van Keuren Co., because of years of pioneering, is able to offer the extra length at little or no extra cost.

You cannot afford to lose this extra length. When you need plug gages obtain a quotation from The Van Keuren Co.—Compare COST PER HOLE GAGED. You can be assured of quality and accuracy. A double inspection at the factory eliminates your inspection expense. No time will be lost waiting for replacements. You can count on prompt delivery from a stock of 2 million wires. Specify Van Keuren wire type gages and get the most GAGE for your GAGE DOLLAR.

Send for Supplement 19 showing quick and easy method of getting 4 to 10 gages from 1 VK wire type gage unit.

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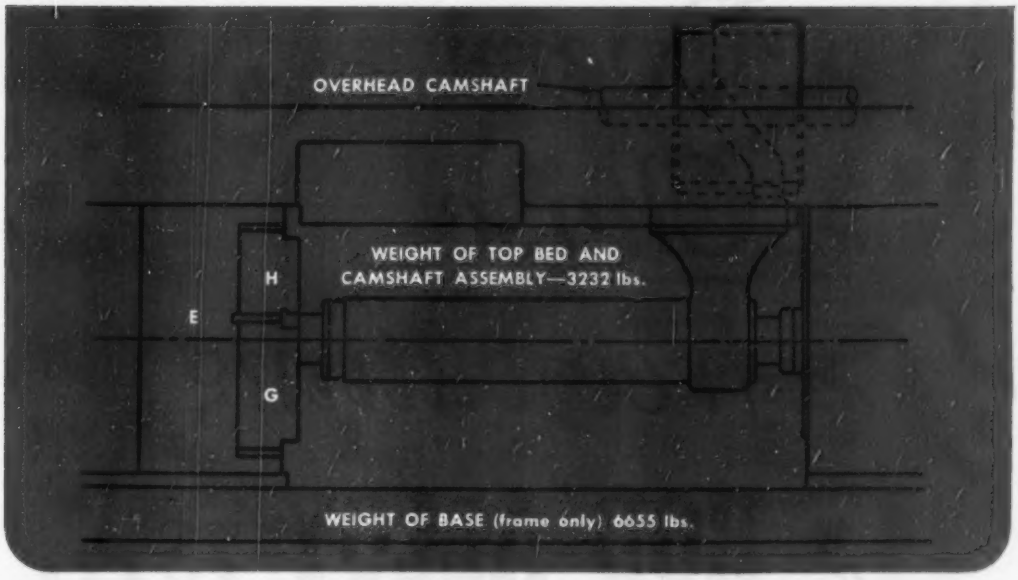


PROFITS BEGIN WITH GOOD BUYING

Machine selection is often the difference between profit and loss, and the choice of one brand over another can be a vital decision. A machine that is not put to its best use is theoretically idle. A poor selection takes toll of all brands of the same type through greater sales resistance and cost. The information prepared for better machine selection before the purchase should be as thorough and useful as that of the operation and maintenance hand books supplied after.

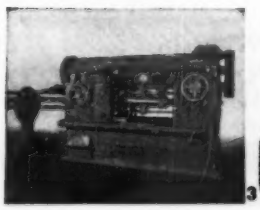
The information given above and below is useful in determining the facility of the 1½" Six Spindle CONOMATIC MAIN CROSS SLIDES:

1. **They have never been equalled for dependable, low cost operation and maintenance in the handling of wide, heavy, form cuts.**

The four, rectangular, box type, CROSS SLIDES, H and G, on front and rear sides of the machine, are nickel moly iron normalized. Their total weight is 296 lbs. They are held in axial position by retaining gibs against the finished wall surface of the machine frame support. They are held in parallel, radial position by their top and bottom flat bearing surfaces with tapered gib adjustment. The total area of their radial bearings, alone, is 444½ square inches.

2. **They have a higher maximum load recommendation than do the cross slides of other "automatics."**

The maximum load recommendation for each MAIN CROSS SLIDE is 3200 ft. lbs. The short (22" high) 11¾" by 44" Frame Support, E, weighs 802 lbs. net. It holds the slides between, and in close proximity to, nearly FIVE TONS of "bridged" construction.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Every Chase free-cutting ROD ALLOY is...

HOT and COLD worked!

TO assure you free-cutting rod alloys of unmatched quality they *all* are extruded and then cold drawn to finished dimensions. This hot and cold working is your insurance that the rod you buy from Chase is of uniform composition and structure...rod that is held to extremely close dimensional tolerances.

And from Chase you can buy any type of rod alloy that you especially need for a particular job. We regularly make 19 rod alloys...several of which should be the answer to your requirements. If not, you can draw upon our extensive Research Department facilities...all as part of Chase Service. Don't you think it worth while to call your nearest Chase Warehouse or Service Office today? You'll get *only the best* for *your* needs!

Chase *the Nation's Headquarters for* BRASS & COPPER

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THIS IS THE CHASE NETWORK . . . handiest way to buy brass

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Hand Reamers
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Morse Taper Reamers
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Rose Chucking Reamers
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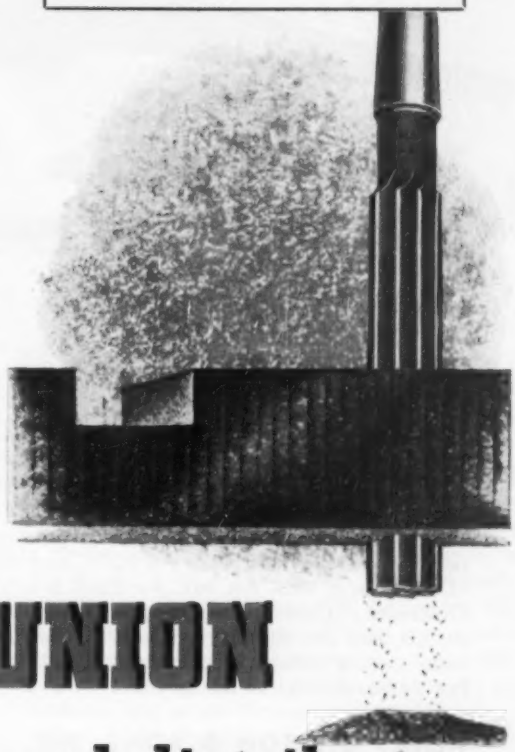
UNION *reamers, standard or special, last longer on every type of job*

Whether you're removing a lot of metal or a few thousandths, on run-of-the-mill or high precision work, Union Reamers are your best bet for the long life and accurate performance that save time and cut production costs.

Chances are your reaming jobs can all be handled by proper selections from the broad range of Union Reamers made to top-quality standards.

See your Union Distributor for all standard or special needs. If your applications are unusual, he'll arrange to get all necessary information, including sketches. Look for his name in THOMAS' REGISTER on Union's insert in the "Drills, Twist" section.



no other reamer will outperform a **UNION**

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist."

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Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

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from a single good source
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DISSTON BITE-RITE® FILES are doing just that. Right in Disston plants thousands of dozens of files are used annually in the regular production of other fine Disston tools. These files prove their ability to do the toughest kind of high-precision work, within rigid cost limits. *That's what Disston makes them for!*

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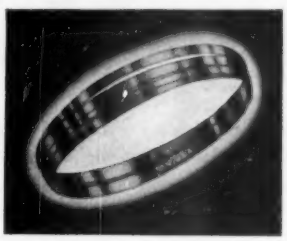
DISSTON METAL-CUTTING BAND SAWS
You can get the correct types from the Disston line—Hardened Throughout and Hard Edge Flexible Back (in regular and buttress tooth patterns).



DISSTON HACK SAW BLADES
for a wide variety of machine and hand metal cutting operations.
IN THESE TYPES: *High Speed • Di-Mol • Chromol* • Duraflex**

*REG. U. S. PAT. OFF.

DISSTON®

PRATT & WHITNEY

SOLID CARBIDE

HOKE PRECISION GAGE BLOCKS

a solid foundation of PRECISION on which to build your reputation for Accuracy and Interchangeability

- Attachments in same box
- Choice of Six Standard Sets
- Individual Carbide Blocks to replace worn steel blocks
- Available through all P&W Branches

HERE are the Gage Blocks that will give you trustworthy *Basic Accuracy* many times longer than steel blocks of equal precision. They are made at Accuracy Headquarters by the nation's finest craftsmen to guaranteed tolerances of +4, −2 millionths of an inch per inch of length. All P&W Carbide Hoke Blocks — from .050" to 4.000" long — are *Solid Carbide*, made from a grade which we believe offers the best possible combination of these qualities: wear resistance, surface finish, wringing ease and permanent stability. The results are extremely long service life and continuing Accuracy — *plus substantial savings!* Write for circular.

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MACHINE TOOLS • CUTTING TOOLS • GAGES

90th P&W Year

SYMBOL OF ACCURACY SINCE 1860

ANOTHER DoALL Achievement

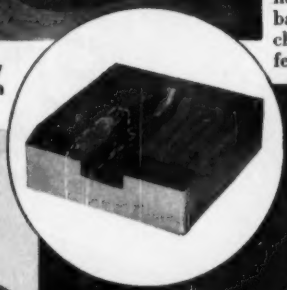
GRIND VERTICALLY

To Machine Heat-Treated Steel

Repair Broken Dies . . . Alter Finished Dies
Machine Hardened Materials . . . Cut Abrasive Materials

The new DoALL Line Grind band gives you a new machining term—"vertical grinding." This band, on the DoALL Contour-matic, performs amazing operations saving thousands of dollars in repairing or altering finished, hardened dies. It's the first machine and only cutting tool combination that will do precision "vertical grinding" on inside-outside and contour cuts.

In the die shop there has always been a need for just such a cutting tool in order to meet a production run by saving valuable dies that become broken, warped or need last minute alterations. DoALL Line Grind bands, having hundreds of abrasive segments mold-welded to the steel band, are available only for the DoALL Contour-matic machine which has the rigidity, pressure coolant and hydraulic feeding necessary for efficient Line Grinding operations.



Die quickly repaired by removing broken section

DoALL Line-Grind Band Tool

At the A. S. M. Metal Congress in Chicago

SEE This new machining method "Line Grinding" and DoALL's complete line of Band Machines, surface grinders and gaging instruments in operation . . . Oct. 23-27, 1950
DoALL Exhibit Booth No. 606

Model ML
Model Z-16
Model V-26
Super Zephyr
Contour-matic
The first band machine tool with complete hydraulic operation

DoALL

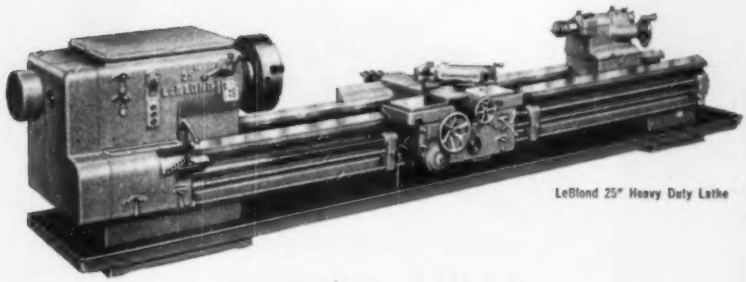
BAND MACHINES and TOOLS for EVERY PURPOSE

27 KINDS—Band Cutting Tools
for Line Milling, Line Grinding, Contour Sawing, Friction Sawing, Continuous Filing, Polishing, Honing
FOR DETAILS WRITE TO . . . . . .

The DoALL Company
Des Plaines, Ill., U.S.A.
Cable Address: DoALL, Des Plaines

Representatives in 56 Countries
DoALL Stores in Key Cities

we mesh fewer gears to give you greater power on...



LeBlond 25" Heavy Duty Lathe

12"
14"
16"
20"
25"
32"

LeBLOND HEAVY DUTY LATHES

No-load Friction HP
20" Heavy Duty Lathe
(20 HP Motor Standard)

LOW RANGE		HIGH RANGE	
Spindle RPM	Friction HP	Spindle RPM	Friction HP
9	.56	18	.75
12	.60	23	.83
16	.64	31	.94
20	.71	39	1.09
26	.49	50	.75
34	.53	66	.83
44	.60	85	1.01
57	.71	110	1.24
71	.68	137	.94
92	.64	178	1.16
119	.71	230	1.50
154	1.05	297	1.91
191	.98	369	1.80
248	1.24	480	2.40
321	1.61	620	3.15
415	2.02	800	4.13

The headstock design of LeBlond Heavy Duty Lathes incorporates the free-running principle, with hardened and ground steel gears.

Result? Fewer gears in mesh at any given spindle speed to minimize no-load friction horsepower. More *smooth* power for your production work. Longer life from your LeBlond Heavy Duty Lathe.

Sixty-three years of machine tool leadership stand behind LeBlond's complete line of 76 lathe models to give you day-in, day-out dependability. Your LeBlond distributor will tell you about our latest models. Call him or write—

THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio.

NOTE: *LeBlond also builds huge 40" and 50" Heavy Duty Engine Lathes.*

LeBLOND Heavy Duty

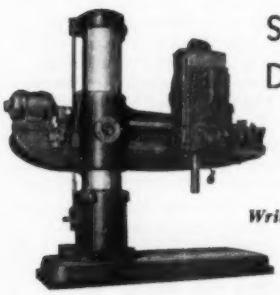
World's largest builder of a complete line of lathes.

$3.50 A MONTH*
. . . AVERAGE MAINTENANCE COST ON
DANLY PRESSES
In HOTPOINT'S plant 5 at Milwaukee!
Here is proof of efficient maintenance procedure *and* outstanding press performance . . . on a high speed production line where press operating expense is a vital cost factor. In more than two years of operation, these Danlys have required no major overhaul or repair—no clutch relining and only one take-up! Highly effective routine maintenance with emphasis on such things as regular lubrications helps, keep small adjustments from becoming costly jobs.
Records like this in nearly every installation are proving Danly leadership in press design and construction. Check the advantages that Danly Presses offer you . . . Danly field engineers are at your service.
Write today for your copy of the new Danly Straight Side Press Catalog.
MECHANICAL PRESSES . . . 50 TO 3,000 TONS
*Does not include cost of power, air and lubricants.
DANLY MACHINE SPECIALTIES, INC.
DANLY
It Costs Less to Run a Danly Press!
2100 SOUTH LARAMIE AVENUE, CHICAGO 50, ILLINOIS

It's all done here

1. Instant change of 36 spindle speeds by three close-set handy levers—on the head.
2. Eighteen feed changes are instantaneously made by two adjacent levers—on the head.
3. Power, column clamping and unclamping is controlled by two convenient push buttons—on the head.
4. Arm elevating and automatic clamping is controlled by a single lever—on the head.
5. Power rapid traverse of head in either direction by single lever—on the head.
6. Start, stop and reverse spindle by one lever—on the head.

At the finger-tip every control is always handy for the operator. His time is conserved and productivity increased. Correct, safe manipulation is easy on Cincinnati Super Service Radial Drills.



Write for Bulletin R-29

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE
Radials 7½" dia. col. 2½" arm to 36" dia. col. 12' arm.
General purpose Uprights 21" to 28" sizes.
Production Uprights 21" to 28"
Jig Borers, Portable Horizontals
Spacing Table Machines

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

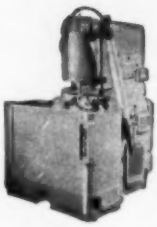
Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.



No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

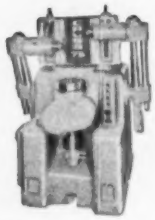
Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

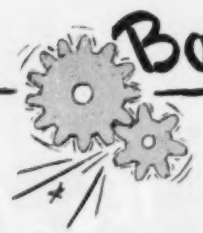


THE **CROSS** COMPANY
Established 1898

SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

Backlash



Spatter Trouble

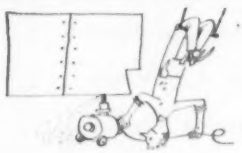
We have a very serious problem with spatter from arcwelding on terne plate!

We have exhausted all means we know of to prevent this and met with exactly zero success. Has anyone else licked the problem, or has any other company a suggestion for overcoming it?

It must be a problem common to all users of terne plate when the material is to be arcwelded, and I wonder whether you might have something to offer in the way of suggestions.

Walter A. Parks
Product Engineer

Commonest cause of weld spatter is too high a welding current. There are, however, several preparations on the market which will prevent spatter from sticking to the work. Such compounds, however, will not prevent the serious loss of electrode material involved in heavy spattering. It might pay you to get in touch with your equipment supplier and get his advice on electrodes and settings. A sure cure would be submerged-arc welding with automatic or the new manual equipment.



Is It Wrong?

The "upside-down" drilling, page 147, July 24 *AM*, is not as new as it may look to some. The old Berliet automobile plant in France, the pattern for the well-known Alco car built by the American Locomotive Company and used largely as a chromo for railway officials perhaps 40 years ago, had a lot of machines which worked that way.

Arthur Pitkin, now the retired superintendent of the Schenectady plant of the American Locomotive Company, spent nearly a year in the Berliet plant in France before the Alco cars were built here. He sent me photographs of some of these machines, which were shown in *AM* at that time. These machines were for both drilling and boring and were designed especially to help chip disposal.

It is a bit odd that the note regarding machines that would run upside down appears in the same issue (Chips, p. 2). While this request is really for chip disposal, it is not for the same reason, but to prevent contamination of the machine by radioactive chips in connection with work on atomic devices. This may provide a new field for designers who can so design the new machines that neither the machine nor the operator need stand on his—or its—head, as shown by your artist.

Fred H. Colvin
Point Pleasant, N. J.

65 Years at Work

On April 3, 1930, you sent out as an extra section a reprint of the March 6, 1880 number.

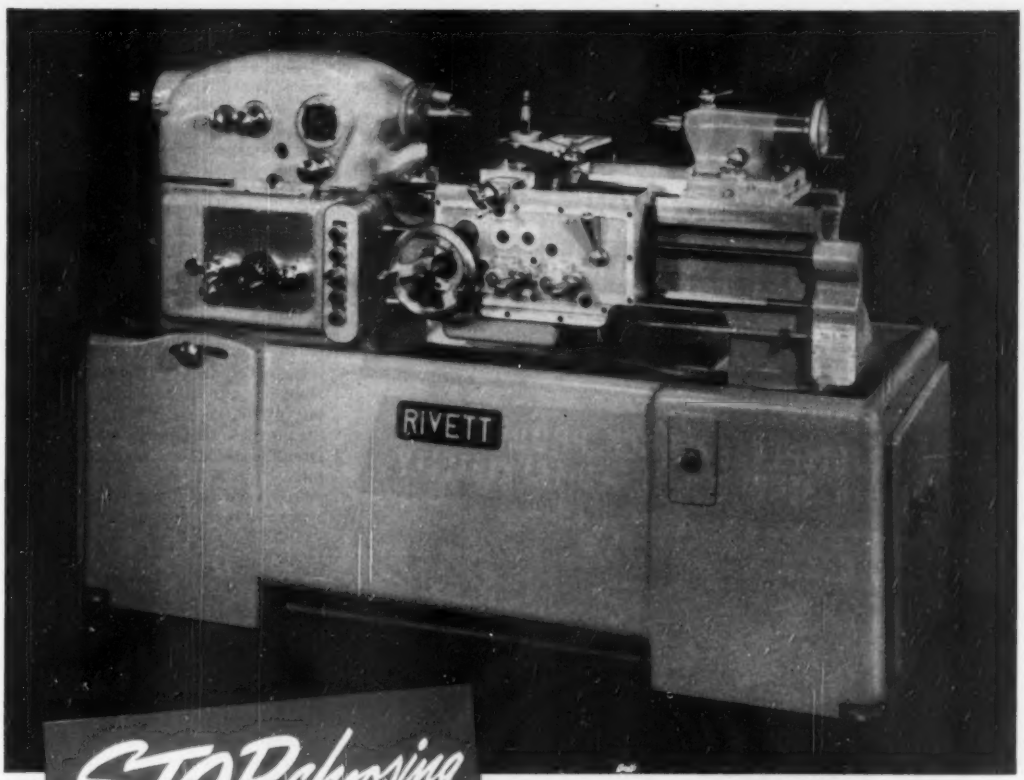
When it came, all the shop men wanted to look it over, and it got somewhat soiled. It is now quite dilapidated.

Our city is building a new city hall, and the American Cast Iron Pipe Company has made a cast-iron box with 22-cu ft capacity to be put into the cornerstone—to be opened in 2050, 100 years hence.

Business men and industries are invited to contribute to the contents of the box. . . . I want to put into this box a few photos of our equipment and output. Also, if we can get another copy of your 1880 edition, I want to put it in along with a few pages from a late edition.

I hardly suppose you have any on hand, but if I can get one it would please me very much.

On July 13, 1885 I went to work as an apprentice, and within a year or so I subscribed to AMERICAN MACHINIST and followed the drawing lessons by J. G. A. Meyer. Machinists here were working 10 hours



STOP choosing work for a lathe!

The NEW RIVETT 1020S TOOLROOM LATHE

Turns anything it can swing!

RIVETT 1020S has what it takes to make an outstanding lathe!

■ 40% heavier than comparable lathes. Weighs 4000 lbs. ■ Back gearing for power cuts—belt drive for high speed. Range from 22 to 3600 R.P.M. ■ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ■ High spindle speeds through mechanical drive. ■ Push button controls for complete operation. ■ Neutral clutch stops spindle without stopping drive. ■ Three bearing mounts for spindle. ■ Collets mount directly in spindle. ■ Hand wheel for turning headstock spindle. ■ Anti-friction bearings used throughout. ■ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ■ Automatic lubrication. ■ Hardened and ground feed screws.

There's no problem in selecting types of work to suit the lathes in your shop when you have 1020S Rivetts. This double-duty machine combines the extreme precision of an instrument lathe and the ruggedness of an engine lathe. Feather-touch sensitivity at high speeds; rugged power in back gearing—it qualifies for any toolroom turning within its 12¾" swing and 20" centers.

Features at left indicate how outstanding the new 1020S lathe really is—for further proof of how outstanding it would be in your shop, write for Bulletin No. 1020A.

RIVETT

LATHE & GRINDER, Inc.

Dept. AMR-9 Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

Now

LEES-BRADNER ROTARY HOBBERS

can bring you . . .

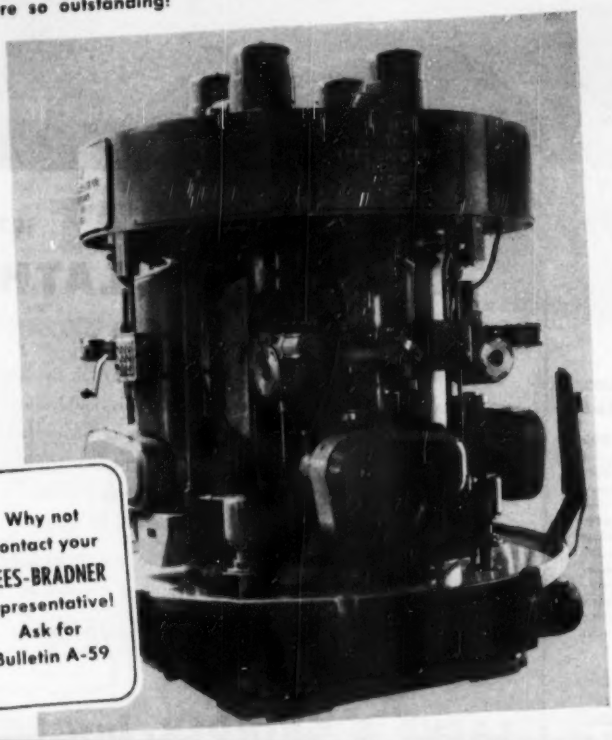
INDEPENDENT MOTOR DRIVES

plus

VARIABLE SPEED UNITS (SIMPLY DIAL SPEED)

MULTIPLE SPINDLE PRODUCTION with SINGLE SPINDLE FLEXIBILITY

plus all the features of simplicity, sturdiness, availability, quick-easy hob changing, diameter control, etc., for which Lees-Bradner Rotaries are so outstanding!



Why not contact your LEES-BRADNER representative! Ask for Bulletin A-59

The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

per day at 26 to 27½ cents per hour. I got 6¢ per hour, then 9, and so on, so the $3 per annum subscription price looked big.

I worked 19 years at the trade, then in January, 1904, a blacksmith and I opened a shop on $200 borrowed money and $600 worth of well-worn machines. Now, 46 years later, our shop has a steel building 60 by 200 ft and some really modern tools: An 8-ft Cincinnati Hypro boring mill; a 6-ft American radial; a Giddings & Lewis 350T boring, milling, and drilling machine; a Gleason 16-in. bevel-gear generator; a 42-in.-by-21-ft,-8-in. LeBlond lathe; a No. 4H Kearney & Trecker milling machine; and so on—also some old but useful relics. My son, Truman Steward, is shop foreman, and it is from his AMERICAN MACHINIST that I have clipped a few pages.

Our men are about 50 in number, and have been with us from 10 to 30 years. We have never had any labor trouble.

What a contrast between the 1880 Blaisdell lathe and the present American hydraulic duplicating lathe in your April 3 number! Also between the 1880 Hendey shaper and the present Cincinnati Utility shown in this late number.

I am writing a letter to the shops of 2050, and am putting in 3 or 4 letterhead-size photos of these modern tools, along with these current pages; and then the 1880 pages for comparison.

It produces a queer feeling to be writing to people who won't be born for 50 or 60 years yet.

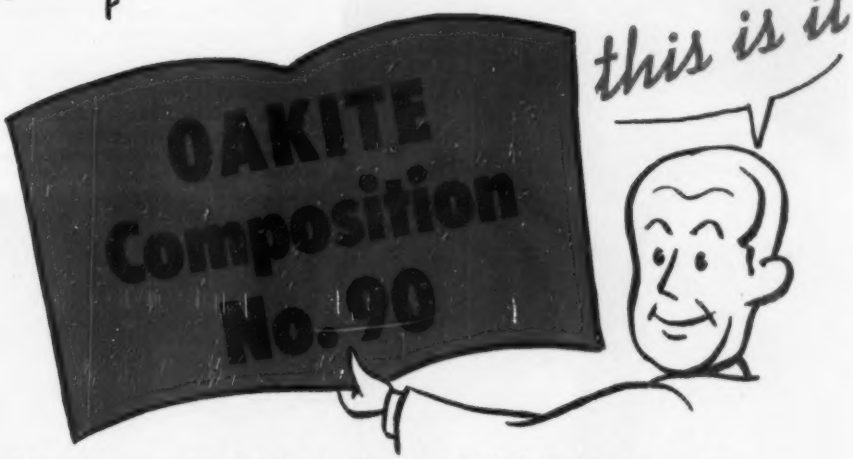
Charles C. Steward
Birmingham, Ala.

Collector

After I read every copy of *American Machinist*, I take a razorblade and cut out the "Refernce Book Sheets," which contain plenty of information. After I have collected a year's supply, I trim them neatly, then bind them. I find a used photo album, cut down to match the reference-sheet size, to be just fine for the purpose. I just clamp the whole unit tightly, drill two holes in the top, and lace the album together with the cord that was in the album. I now have a nice reference library.

Lawrence W. Farmer
Dayton, Ky.

if you're looking for the best in reverse-current cleaning of steel before plating



Maybe Oakite Composition No. 90 is just the electrocleaner you need. It effectively removes oils, greases, smuts—all the objectionable films that interfere with *good plating*.

How does Oakite Composition No. 90 work? High conductivity keeps oxygen bubbling off work, prying dirt loose at a rapid rate. Wetting and dispersing action speeds up cleaning. Water softening ability prevents formation of sticky soap films. Buffering action lengthens solution life. Bubbles are just strong enough to *prevent* thick, explosive foam.

In short, Oakite Composition No. 90 meets all your needs for better reverse-current cleaning. Proof? Send coupon for electrocleaning demonstration or literature. No obligation.

For **FREE** *Data Send Coupon To:*

OAKITE PRODUCTS, INC.
24 Thames St., N. Y. 6, N. Y.

At no cost to me, send information about:

- ☐ electrocleaning
- ☐ brass-cleaning
- ☐ steam-detergent cleaning
- ☐ alkaline cleaning
- ☐ machining coolants
- ☐ pre-paint treatment
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- ☐ spray-booth water treatment
- ☐ paint-stripping
- ☐ barrel-cleaning
- ☐ rust control

OAKITE

Trade Mark Reg. U. S. Pat. Off.

INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

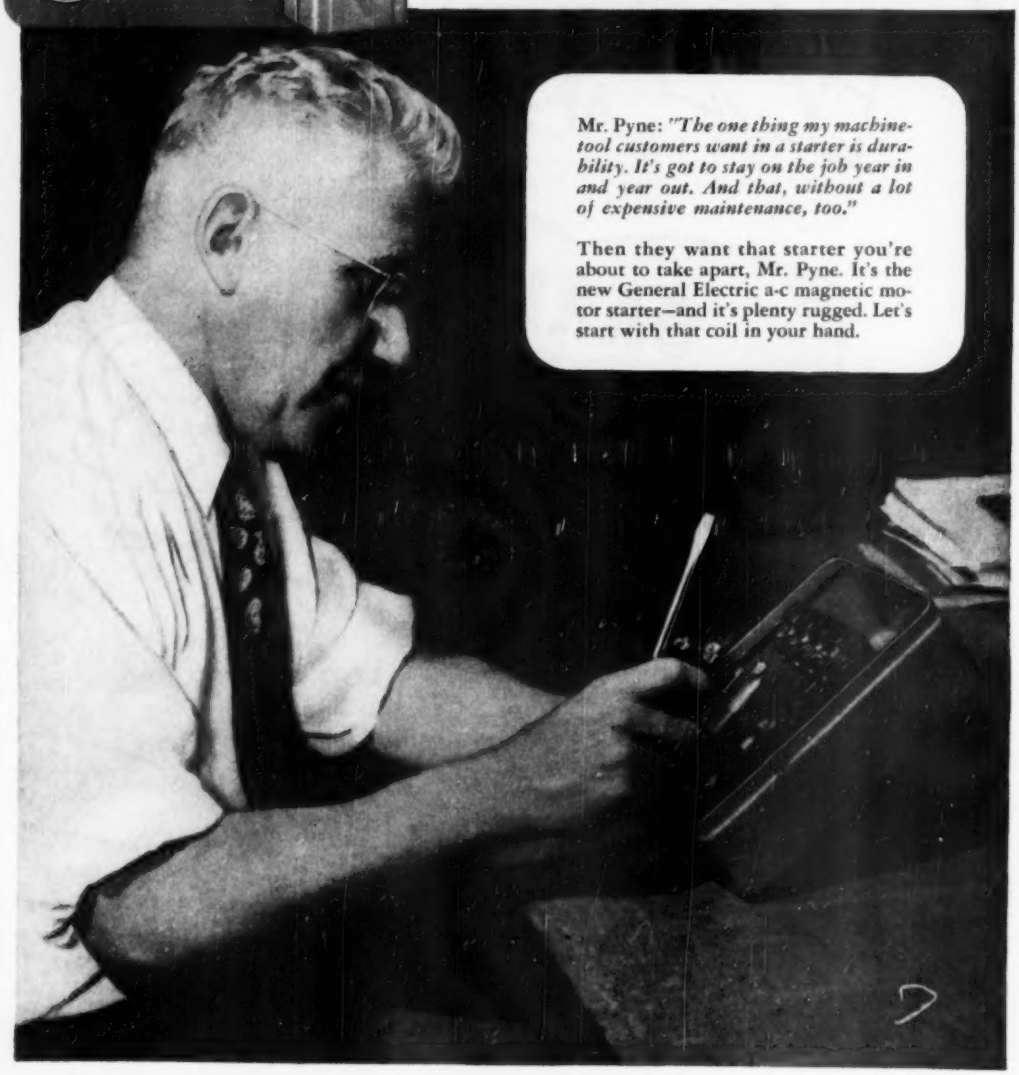
Technical Service Representatives in Principal Cities of U. S. & Canada

New!

MOTOR STARTERS

5 reasons why

R. S. PYNE, THE VAN NORMAN COMPANY,



Mr. Pyne: *"The one thing my machine-tool customers want in a starter is durability. It's got to stay on the job year in and year out. And that, without a lot of expensive maintenance, too."*

Then they want that starter you're about to take apart, Mr. Pyne. It's the new General Electric a-c magnetic motor starter—and it's plenty rugged. Let's start with that coil in your hand.

GENERAL ELECTRIC

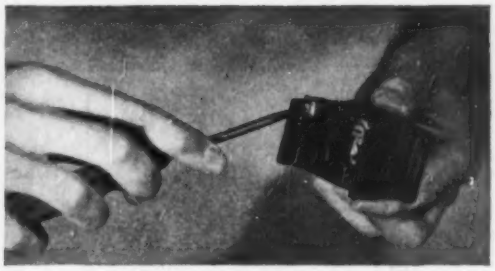
730-11

G-E starters last longer!

PROVES IT FOR HIMSELF WITH THE SCREWDRIVER TEST

Mr. Pyne: *"Looks different. What's it got?"*

1 That coil—we call it the "strong box" magnet coil—lasts two to five times longer than a conventional coil. Suppose the electrician's screwdriver slips and hits the coil. The windings can't be damaged because they're firmly locked in a block of molded plastic.



Mr. Pyne: *"Will these terminals work loose?"*

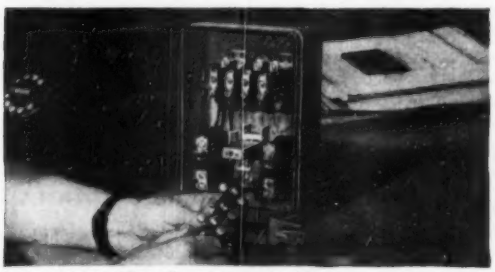
2 Not a chance! They're permanently anchored in the coil enclosure so they can't loosen, even after years of operation. You'll notice they're on the front of the coil, too. That makes for easier servicing.

Mr. Pyne: *"This magnet moves smoothly enough."*

3 Yes—and you can be sure it will do just that even after it's been in service for years. That's because the plastic coil block is made with a permanent "molded in" lubricant. No metal-to-metal friction, no bearings to wear!

Mr. Pyne: *"Contacts that burn easily seem to be a major headache. How about these?"*

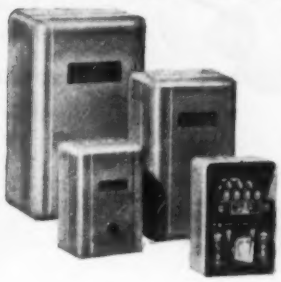
4 Under average conditions you can count on these contact tips to stand up even on the toughest "start-stop" service. They're made of fine silver and there's little chance of their welding together thanks to a high initial tip pressure. And the arc hood keeps each tip protected in its own chamber.



Mr. Pyne: *"What about corrosion?"*

5 No problem at all! All steel parts are zinc plated. The arc chutes are impregnated with a special wax to resist moisture absorption. Finally, the case is coated with a special corrosion-resisting material and painted an attractive gray.

WHY DON'T YOU BUY ONE AND COMPARE

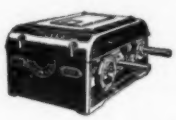


Make the screwdriver test yourself — and see why the new G-E magnetic motor starter lasts longer than any other you can buy. Your G-E representative or distributor salesman can supply you with this new starter from stock in NEMA sizes 0, 1, 2, and 3 for a-c motors up to 50 hp. For a complete description, write for the "tell all" bulletin, GEA-5153. *Section 730-11, Apparatus Dept., General Electric Company, Schenectady 5, N.Y.*

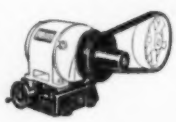
"There's Bascom, again—showing the boys how to split an rpm with that new Reeves-equipped machine"

THE 3 BASIC REEVES UNITS

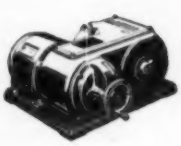
VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.



VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 10 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in a single unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 20 hp. (Also available in fractional hp sizes with speed variations of 10:1.)



At the turn of a handwheel or touch of a button, the operating speed of the machine equipped with REEVES Speed Control may be changed instantly. Any speed selected is accurately and *positively* maintained indefinitely—assuring the absolutely correct speed for every operation and every operator under every changing condition. As a result, rate of production is increased; quality of product is improved; and manufacturing cost is reduced.

For your machines, new or old, standardize on infinitely variable, accurate and *positive* REEVES Speed Control—proved beyond the shadow of a doubt in more than 265,000 installations covering virtually every industry. Choose from a *complete* line of units and controls—send for your *free* copy of the new, 132-page catalog No. A49-3N.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

accurate • variable **REEVES** *Speed Control*

SPOT NEWS of Metalworking

- **Breakdown of military hard goods to be bought in U.S. for military arms aid** with all 1950 and 1951 money shows: $3,266 million for ordnance equipment and supplies; $1,235 million for aircraft, spare parts, and aviation ground equipment; $448 million for electronics and other signal equipment; $186.4 million for fighting ships, both small and large; $123.8 million for engineering equipment and supplies.

- **Increased manganese output is expected from Bureau of Mines beneficiation and leaching tests** being made on low-grade manganese ores in Arizona and Maine. Results to date indicate that 60% of manganese from one site in Arizona can be recovered in a concentrate assaying about 42% manganese. Tests are being made also to recover manganese from steel plant slag by reducing slag to produce spiegeleisen, then by selective oxidation of the spiegel to produce a high-manganese low-phosphorous slag.

- **Small "autoselector" which rotates control shafts to pre-set positions** is Dutch development to be made and sold in United Kingdom and marketed in U.S. Accuracy through electrical control is within 0.05; time required is 2 seconds on small model, under 10 on large. Possible applications are radio and machine tool dials.

An all-magnesium-alloy airplane is planned by Air Force. Wings made entirely of magnesium-zirconium alloy have been tested on Lockheed F-80, employing a thick, unreinforced skin as surface covering in place of conventional stringer-reinforced, thinskin type of construction.

- **New plan of curtailed inspection by Air Force has been tried** at Lockheed Aircraft Corp. Plan calls for discontinuance in all departments of routine Air Force spot inspection operations. Instead, actual physical inspection work will be made by Lockheed employees, although Air Force quality-control personnel will continue to check Lockheed's inspection operation. Major purpose is to minimize delay in aircraft production.

- **Mixture of powdered iron and dry lubricant for use in magnetically-operated clutches,** brakes, and coupling devices has been developed by Eaton Manufacturing Co., Cleveland. Devices containing this dry mixture, when energized by controlled electrical currents, are said to improve the response to an increase or decrease of the excitation current. It simplifies problem of sealing devices against leakage and minimizes viscous drag.

- **New line of milling machines designed specially for use of aircraft industry** in milling aluminum-alloy and magnesium-alloy parts at very high speeds with carbide cutters is being introduced by Kearney & Trecker. Motor-on-spindle is liquid cooled. There are no gears on spindle drive, and no belts.

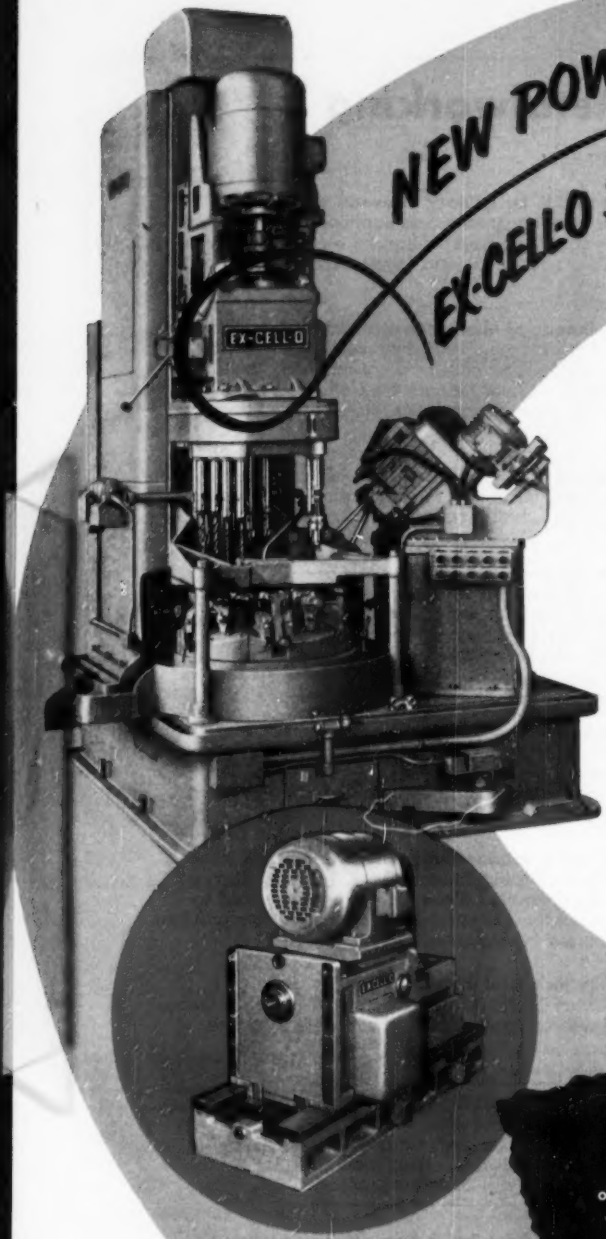
Miniature car, the "Trippel SK. 10", will be mass-produced soon in French Zone of Germany. Car will be two or three seater, with twin-cylinder four-stroke, 500cc "Heck" engine, air cooled. Underside will be smooth, dust-tight, water-tight. Open model of same car is planned next year as amphibian with screw propulsion.

- **New lightweight alkaline battery has been introduced by British firm.** Based on silver-zinc reaction—silver positive and zinc negative electrodes, potassium hydroxide electrolyte—the cell is one-third to one-fifth weight of batteries of comparable capacity, with one-half the volume. Ampere-hour efficiency claimed is over 90%.

- **Ending of blanket exemption of World War II veterans** and lifting of the 25-year draft age limit are being considered as two possible Selective Service Act changes.

- **Swiss have developed timing device that automatically pulls parachute ripcord** at a pre-set safe altitude. Dial is set for desired altitude. A wire loop pulls out when parachutist jumps. This starts watch ticking. Ripcord passes through a hole in metal tube; at right moment, small sharp knife comes down through tube, severing the cord, permitting parachute to open.

NEW POWER UNITS FOR EX-CELL-O SPECIAL MACHINES



CONFORM TO J. I. C. STANDARDS

This Ex-Cell-O Special Machine utilizes a new slide type hydraulic power unit for rotating and feeding the tools in the multiple spindle head. The new power units, in two sizes to accommodate motors up to 25 horsepower, are built in strict conformance with the standards established by the Joint Industry Conference of the automobile industry.

Ex-Cell-O Slide Type Hydraulic Power Units do not replace the standard Ex-Cell-O Quill Type Hydraulic Power Units which are used to drive less bulky multiple spindle heads or single tools. Both types of units often are used to good advantage on the same machine.

For economy in multiple machining operations such as drilling, reaming, spotfacing and counterboring, be sure to get a quotation on an Ex-Cell-O machine with standard, versatile Ex-Cell-O Hydraulic Power Units.

XLO

Ex-Cello-O Style 91 Slide Type Hydraulic Power Unit with motor mounted for horizontal installation. Same unit is mounted vertically on machine above.

FEATURES

of Ex-Cell-O Slide Type Hydraulic Power Units

1. Conform to J.I.C. standards
2. Smooth hydraulic action
3. Simple construction—no gears
4. Adjustable automatic cycles
5. Self contained—can be re-used
6. Hardened, ground steel ways
7. Manifold-mounted hydraulic components
8. Positive stop in line with thrust

30-31

EX-CELL-O CORPORATION

DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

New life in defense planning is one thing you can count on to result from the recently-formed—and unofficial—Joint Secretaries of Defense.

They're the civilian counterpart—and foil—of the Joint Chiefs of Staff. It's the civilian balancing the military mind.

It was the joint secretaries that worked out the $10.5-billion emergency defense appropriation that scrapped the one-third-to-each-service tradition.

They also agreed that Navy's air arm should rank equally with the Air Force.

Right now they're working on a plan to put teeth into the State Department's badly managed psychological warfare program.

A frontal attack on the problem of guided missiles —both as a potential danger, and as a potential weapon—is another project they're working on.

Look for a coordinated—and expensive—guided missile development program to follow. It means the day of the intercontinental rocket will come a lot sooner than anyone expected. It also means completion of the North American radar screen and its automatic interceptor system will be accelerated.

• • •

Tighter export controls are due any day now. They'll aim at conserving critical materials needed by U. S. industry, as well as at keeping them west of the Iron Curtain.

It means foreign buyers may soon have to show a priority to be able to buy products of steel, aluminum, rubber, copper, zinc, possibly lead and others.

• • •

Military budget estimates for 1952-through-1954 of $24 billion don't include dollars for arms aid, stockpiling money, other mobilization funds not included in the Defense Department budget.

Neither do they include the cost of other flare-ups along the East-West battle line. Winning in Korea alone will cost the American taxpayer close to $5 billion.

• • •

Virtually all of this year's $5-billion for arms aid will go for hard goods procurement, almost all the money being spent in the U. S. Only $153-million will be used for actual arms procurement from European sources.

But, some $321-million will be used for supplying expanded European arms production with machine tools, nonferrous metals, steel, patent rights, and the like.

Of this last amount, $124-million will go for purchases of much needed special U. S. machine tools.

The countries of western Europe plan to add an additional $2,480 million to their collective defense budget. $475-million of U. S. funds for tools and materials will help them achieve that goal.

Only a small portion of total arms aid procurement will come out of existing stocks of U. S. surplus military equipment.

The need now is for an effective European fighting force — with modern weapons — not a token force for propaganda purposes.

• • •

Look for a fifth round of wage increases this winter as unions try to catch up with rising living costs before the government freezes wages.

Trend is toward short-term contracts or frequent wage review, with cost-of-living escalators like that in the General Motors contract.

GM wages are already 21 cents-an-hour over what they were when UAW-CIO President Walter R. Reuther signed the contract in May, 1948, and it will go even higher as living costs rise and because of the 4-cent "annual improvement" increase due in June.

• • •

Steel contracts, reopenable on Jan. 1 on wages alone will set the pattern for the fifth round. CIO President Philip Murray will stress the higher GM wages in his negotiations with the steel industry.

It will spread to other automobile and metalworking plants as new contracts come up for negotiation.

Don't plead inability to grant wage increases unless you're willing to back it up with financial data if the union requests it. Otherwise you're bargaining in bad faith. (NLRB in the Southern Saddlery case.)

• • •

Free speech isn't a license to slander: A U. S. circuit court rules therefore you can stop a union from passing out scurrilous union literature on plant property.

• • •

New Social Security law brings new benefits to retiring workers even though their $100 pensions, including Social Security, can't be raised. It adds as much as $70 a month more to his dependents.

• • •

Industrial designers are professional employees, therefore may, if they wish, withdraw from a bargaining unit that includes production workers. NLRB is allowing designers in Chrysler's styling department to vote for or against UAW-CIO as their bargaining agent.

FOR A **FUNCTIONAL** SURFACE FINISH

MICROHONE[b.] *

20[a.] √ ×[c.]

a. **CONTROLLED SURFACE ROUGHNESS**
Any desired surface roughness duplicated in every part

b. **NO WAVINESS OR SURFACE IRREGULARITIES**
A true geometrically-accurate surface with no high spots to break the lubricating film and cause high localized heat

c. **A CLEAN-CUT CROSS-HATCH PATTERN (LAY)**
The cross-hatch pattern characteristics of the MICROHONING process is unlike that of any other machining operation. It is free of fragmented, torn or smear metal that will wear or flake off under load.

* SURFACE-FINISH SYMBOLS recommended by SAE Surface Finish Committee and its sponsor the American Standards Association.

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DISTRICT FIELD OFFICES:
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MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

Detroit

The feel of war lies more heavily over Detroit and the automotive industry, day by day. Most notable, of course, is the inflow of military contracts, proposed and actually signed.

First came the Cadillac tank job—a full new operation begun in mid-August in Cleveland. Requirements: Several million in new tooling (as much as possible from war reserve stocks of machine tools, the rest from manufacturing companies); a payroll of more than 5,000 people; and orders for components which will go to an estimated 600 suppliers.

• • •

There are also other jobs of magnitude on the immediate horizon. Ford is expected to sign for work. So is Packard. Continental Motors, primary powerplant producer for Ordnance, is being given new aircraft engine assignments as well; its backlog is climbing rapidly.

• • •

A fair sized machine tool program can be expected from Canadian affiliates of General Motors Corp. One large one: At General Motors of Canada, Oshawa, Ont., where facilities will be installed very shortly to resume manufacture of Buick cars. Engines will be imported from United States, but other major components, including bodies, will be manufactured in Canada.

Another large program: At a new plant for Frigidaire Products of Canada, Ltd., near Toronto. This plant will produce household and commercial refrigeration, electric ranges, other appliances. The present Frigidaire plant at Leaside, Ont., is operating at capacity; no more land is available for expansion.

At McKinnon Industries, Ltd., St. Catharines, Ont., a new 135,000 sq ft plant will be equipped to provide for an increase of about 30% in automobile parts and accessories. Farther in the future is a tooling program for an automatic transmission—type as yet undecided—which will probably be put into production in time for 1952 models.

Another possibility for expansion is the recently opened General Motors Diesel, Ltd., plant at London, Ont. Currently it is set up to produce locomotives only. But in another 5 to 10 years it probably will be tooled to produce engines for the petroleum industry, for marine use and for stationary installations.

• • •

Sales, meanwhile, are still moving at a torrid pace. Dealers are clamoring for all the cars they can get, even though the insistent pressure which followed Korea has abated mildly. One apt clue to demand: Kaiser-Frazer has added a second shift to build output to levels more nearly in line with field requirements.

Rubber controls and curtailments, indicated for the near term, will have a halting effect on automobile production by the end of the year.

• • •

Looking well into the future from the Detroit view, a guns and butter economy would not have too much effect today on 1952 models, but definitely would affect the 1953s. Reason: Technical manpower shortages. Today, of course, tooling for 1951s is about 60 days from windup. Planning for 1952s is close to completion; first tooling will go into the shops when the 1951 programs come out. Plans for 1953, however, are definitely fluid at this time. Planning and designing is far from complete. As a modified transition is made toward more war work, these technicians will be needed on arms jobs. The 1953 model program will suffer.

• • •

Packard showed its 1951 models in late August, in spite of a strike over wages and pensions which crippled its production practically on the eve of announcement. There are more powerful engines, with compression ratios definitely in the modern mode—up to 7.8 to 1. There are handsome new bodies which vault Packard right to the forefront of the style parade (see photograph).

Coming next: Hudson and Nash. These announcements can be expected to be somewhat less noteworthy than Packard's.

THREE NEW PACKARDS—the Patrician "400" (foreground), the "300" (center), and the "200" in background.

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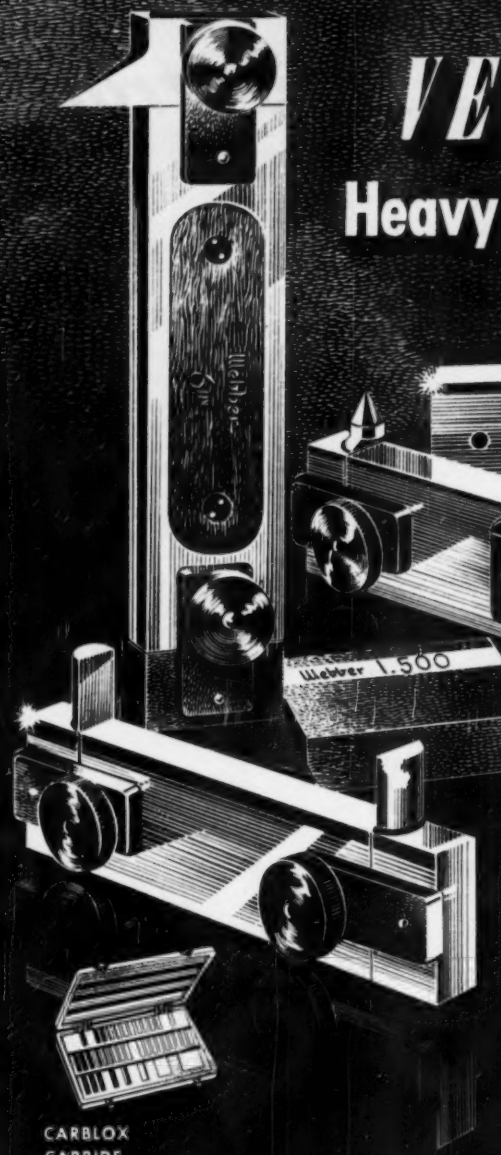

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New Tooling

Machine tool orders in July soared to heights not reached since March 1943, a peak war-production month. The July figure of 253.3 on the NMTBA index more than doubled that for June (see chart).

Most new orders are believed to be coming from companies attempting to get in under the wire before a looked-for freeze by the government. Few defense orders are showing up. More will be seen late in November.

Orders were well distributed, with practically every machine tool builder participating, and for just about every type of machine.

• • •

Backlog for the industry in July was equal to seven and a half months at current rate. In June a five months' backlog was reported.

Drop in shipments from June's 91.9 to 68.0 for July is attributed to plants being closed for employee vacations.

• • •

August volume of new machine tool orders will not be as high as for July, although some larger tool builders are reporting August business on the July level.

Convinced that a period of sharp inflation is just around the corner, a number of builders are anticipating a flood of orders from customers if and when such a trend develops.

A semi-allocation of products has been set up by some builders. Representatives have been informed, but the word has not gone out officially.

Orders are being accepted only on an extended delivery basis, except for isolated instances. Turret lathes, boring machines, and punch presses of all sizes are in heaviest demand, with shapers, tapping machines and large-sized planers at the bottom.

• • •

Tooling up at Cadillac for production of tanks will be simplified somewhat by obtaining many needed machine tools from government reserves. But there will be a liberal number of new machines necessary for which orders have either gone out or will be placed immediately.

Major machining on the hull and turret and assembly of the tanks will be done at the Cleveland Tank Plant. More than 600 suppliers have been alerted to requirements of this program.

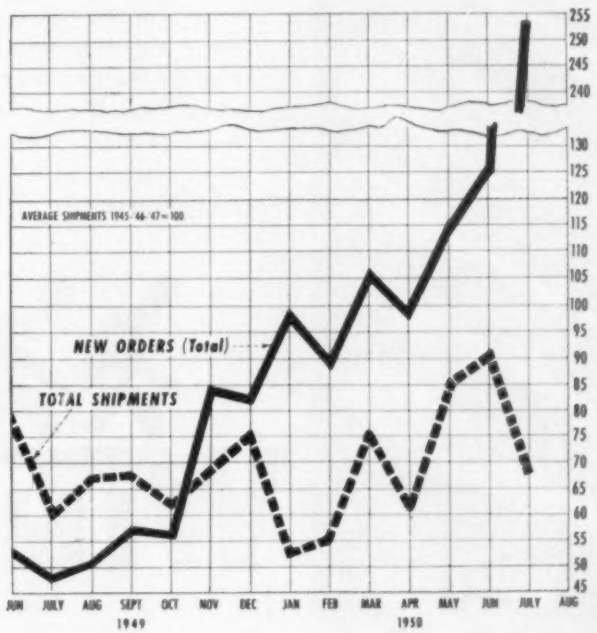
• • •

Contracts to build tank-type vehicles have been received also by International Harvester (armored personnel carriers), American Car & Foundry (self-propelled howitzer motor carriers), Pacific Car & Foundry (gun motor carriages), and Massey-Harris (howitzer motor carriages).

MACHINE TOOL ORDERS SET POSTWAR RECORD

	New Orders (Total)	Foreign Orders (Included in Total)	Shipments (Total)
1948			
Jan.	83.1	14.0	75.3
Feb.	77.3	12.7	87.1
Mar.	86.3	16.1	83.6
Apr.	86.3	14.1	82.0
May	73.5	11.4	82.6
June	83.4	11.9	94.4
July	74.0	13.3	62.4
Aug.	73.7	13.6	69.8
Sept.	73.1	11.6	84.7
Oct.	67.4	14.0	80.4
Nov.	72.2	18.1	76.2
Dec.	76.7	16.2	96.9
1949			
Jan.	87.0	21.9	68.8
Feb.	80.9	26.5	70.3
Mar.	93.5	22.3	75.8
Apr.	70.1	23.1	74.7
May	63.7	15.8	72.8
June	53.6	15.7	79.0
July	48.0	14.0	60.7
Aug.	51.5	18.8	67.3
Sept.	57.7	13.7	67.6
Oct.	56.8	13.7	62.3
Nov.	84.3	17.0	67.6
Dec.	82.5	22.4	75.7
1950			
Jan.	99.7	26.7	52.8
Feb.	89.2	18.8	56.1
Mar.	107.4	24.9	75.3
Apr.	98.9	17.4	61.6
May	116.4	18.4	82.5
June	124.1	23.0	91.9
July	p 253.3	p 22.0	p 68.0

Data: NMTBA p — Preliminary figures



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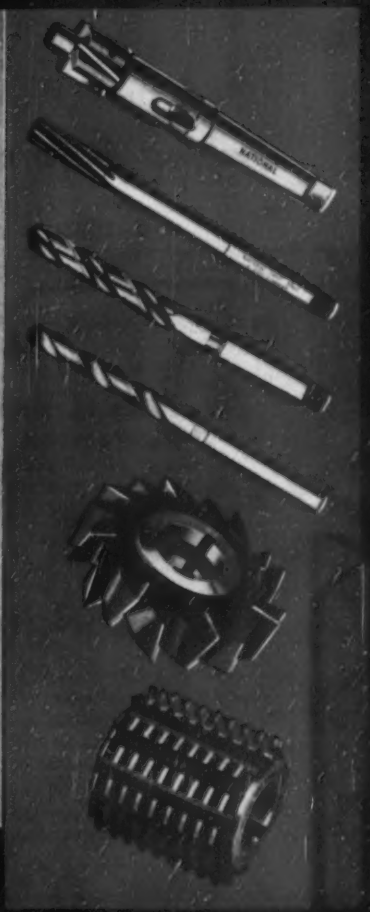

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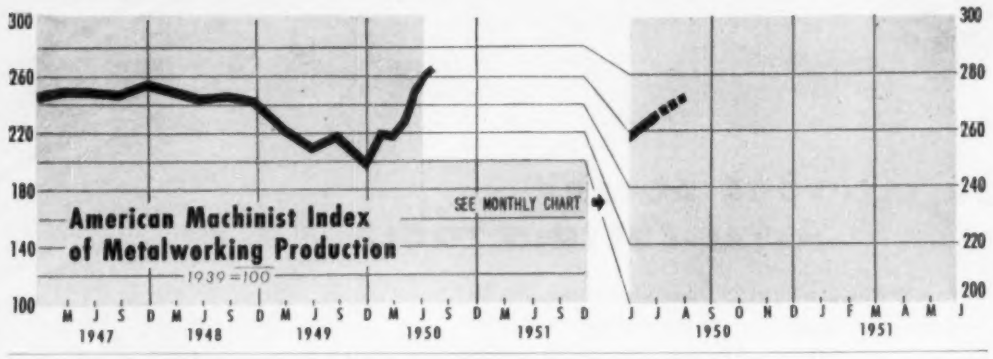
Gaging Metalworking



Metalworking Output Continues to Climb

Metalworking continues to rise apace with the stepped-up industrial mobilization program. July production, in manhours, hit 264 on the AMERICAN MACHINIST Index, an increase of 20% over July 1949.

In August it is expected to reach 270. By end of year, the index will near 300.

• • •

The expected increase depends a lot on immediate expansion of the transportation equipment group which has remained relatively low so far. If airplane plants, shipyards and freight car builders start turning out the goods then the index is sure to zoom.

This trend may be indicated by the expansion in June of unfilled orders in the transportation equipment (excluding motor vehicles) industry.

• • •

Farmers still are scare-buying all available farm machinery. Retail stocks and wholesale inventories of farm equipment are practically down to nothing.

Office equipment manufacturers have been scoring gains since Korea. The scare of future material shortages and lack of experienced clerical workers are reasons for this boost.

• • •

Civilian share of the economy should remain high for the next six months, unless the war gets warmer. Only a relatively small share of total production of important metals is needed by the military for the July 1950-June 1951 year.

The U. S. military will need 4 million tons of steel out of about 100 million tons to be produced this year, about 7% of the copper supply or 175,000 tons, and 100,000 tons of aluminum, 14% of U. S. current production, according to Defense Secretary Johnson.

These quantities are based on the $25 billion military expansion program. Additional amount is expected to be spent for steel, aluminum and copper so that Europeans can get help to turn out their armaments.

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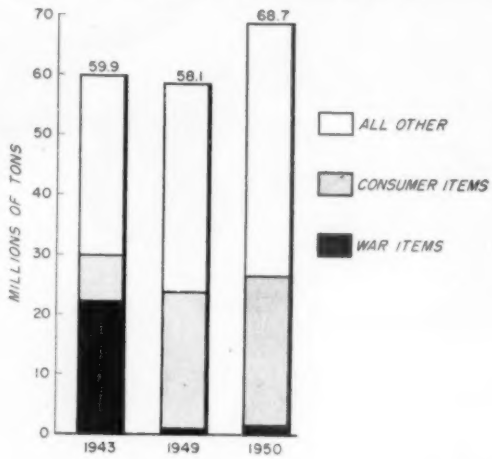
Government wants capacity in the steel industry to be increased to 115-120 million tons by 1955. The industry has plans for 106 million tons capacity by end of 1952.

STEEL USE — WORLD WAR II AND NOW



INDEX

	AUG. '50	JULY '50(p)	JUNE '50(r)	JULY '49
	270*	264	258	220
Machinery		244	234	203
Electrical Manufacturing		303	289	228
Automobiles, Trucks		260	260	209
Transportation Equipment		249	225	260
Other Metalworking		285	273	233

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

What this means in production of war and peace goods has been figured out by the American Iron and Steel Institute. Everyday, the finished steel made from 24 hours of full output of ingots and castings will provide steel for all of the following items:

An aircraft carrier, 500 airplanes, 1000 anti-aircraft guns, 500 tanks, half a million 3-inch shells, 1000 howitzers, 2000 aerial bombs, two heavy cruisers, 12,000 autos, 2000 homes, 20,000 household refrigerators, 20,000 stoves. 200 trucks, two cargo ships, two tankers, and 1000 freight cars.

• • •

Despite that steel capacity, the fact remains that there are shortages. Those 1000 freight cars are getting some of the blame.

No little criticism is being directed toward railroads with announced car-building programs. Steel users see in such a program the cause for further tightening in the steel supply.

Timing by the railroads was far off for a car-building program, many of the warehouse managements and members of the metalworking industries feel.

• • •

Principal worry of the stamping industry right now is availability of steel. Those who have been accustomed to securing some of their supplies from steel mills with more rolling capacity than melt capacity, find that source limited.

Sellers of ingots in the past have by now increased their rolling capacity so that fewer ingots are available for the non-integrated rolling mills.

Stampers are also discovering that there is not as much steel being offered at gray market prices as right after the war. Main reason is that the automotive industry is operating now at enlarged capacity and taking delivery on all the steel it can procure.

There is plenty of activity in the gray market. Scarce sheets and strip are being quoted at $280 to $330 per ton. Established steel warehouses are doling out stocks in 5,000 and 10,000 lb lots to their regular customers and in smaller quantities when possible.

While pipe, sheet and strip continue to be the items in short supply, bar steel is edging up to join that trio since it is becoming scarcer with longer delivery required by the steel makers.

• • •

Copper and brass users fear a serious supply shortage in the near future largely because of an increased demand for finished items, plus a reduction of basic copper stocks. Some suppliers are reported to be setting up allocation systems based on previous purchases of customers.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week index of activity (1923-1925 = 100)*	220.3	220.8	183.2
Steel ingot operations (% of capacity)	90.6	100.1	84.8
Electric power output (million kilowatt-hours)	6,370	6,253	5,579
Production of automobiles and trucks	192,511	182,965	149,359
Engineering construction awards (Eng. News-Record; millions)	$198.8	$250.1	$147.7

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production* (1935-1939 = 100)	199	195	169
Index of durable manufacturers' production* (1935-1939 = 100)	236	231	194
Durable goods manufacturers' sales* (millions)	$9,550	$9,089	$7,745
Electrical machinery manufacturers' sales* (millions)	$994	$918	$730
Other machinery manufacturers' sales* (millions)	$1,352	$1,350	$1,195
Durable goods manufacturers' sales* (millions)	$10,665	$8,909	$6,544
Electrical machinery manufacturers' new orders (millions)	$1,060	$891	$702
Other machinery manufacturers' new orders (millions)	$1,545	$1,420	$1,017

*Seasonally adjusted.

16 MACHINING STEPS

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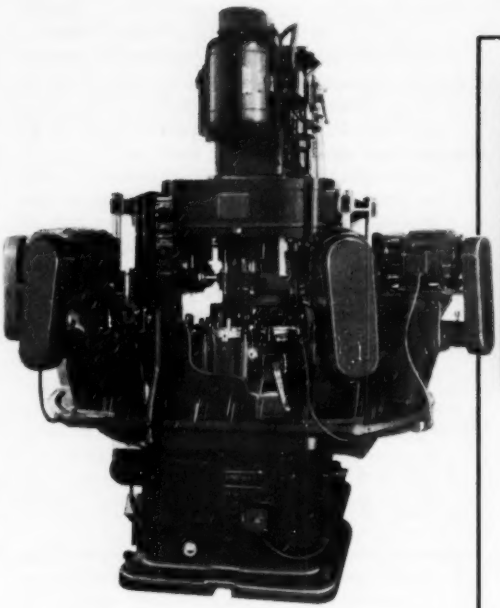
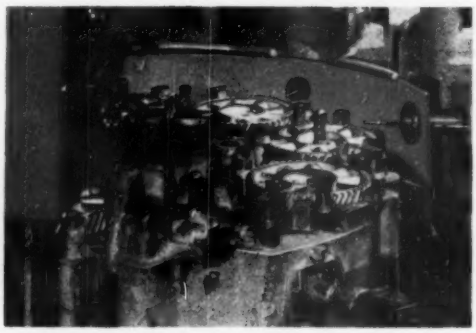
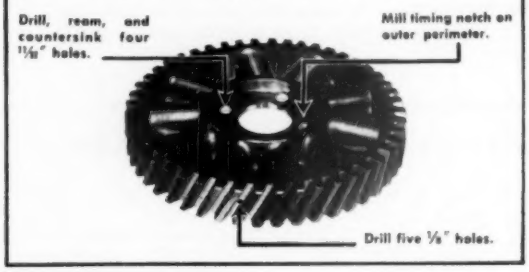




Two cycle operation performed on a camshaft gear; production 288 pieces per hour at 80% efficiency. The machine is a four station vertical type unit with a 29" table. A self contained hydraulic unit is mounted on the column. This unit carries an eleven spindle vertical head and a single spindle milling head driven through the vertical multiple spindle head. Five single spindle quill type heads, independently motor driven, are mounted radially on the platen.



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Why We Are Strong

Twice within the lifetime of many of us, America's industrial resources have been mobilized for war. And twice the prodigious output of our mines and factories have played a decisive role in bringing victory to our side.

Just now we are seriously involved in the Korean "incident." It has blossomed into full-scale warfare. No one knows whether it is the prelude to a third world war.

But facing an uncertain future, we should pause and appraise our industrial position today compared with the day that Hitler's hordes crossed the Polish border eleven years ago.

OUR CAPACITY for producing raw materials is much greater now than then. We have facilities for making over 100 million tons of steel a year, one-quarter more than in 1939. Our aluminum industry is three times its size a decade ago. We possess a magnesium industry which at the beginning of World War II was only a fraction of its present capacity.

Our extensive synthetic rubber industry didn't even exist at the time of the Pearl Harbor tragedy. America's chemical resources, in fact, have grown almost like magic the past ten years.

Going from raw materials to fabricating facilities, we find the same kind of growth. Metalworking is operating today at two-and-a-half times the 1939 rate, based on manhours worked.

There are many more plants now than then. Some of them are "standby" factories from the last war. Others have been built in the postwar period.

The number of machine tools installed in the nation's metalworking shops is nearly double that in 1940, according to American Machinist's Five-Year Inventories of Metalworking Equipment.

Our supreme technical achievement, almost at the end of World War II, was production of the atom bomb. Our facilities for making it have been widely extended since then.

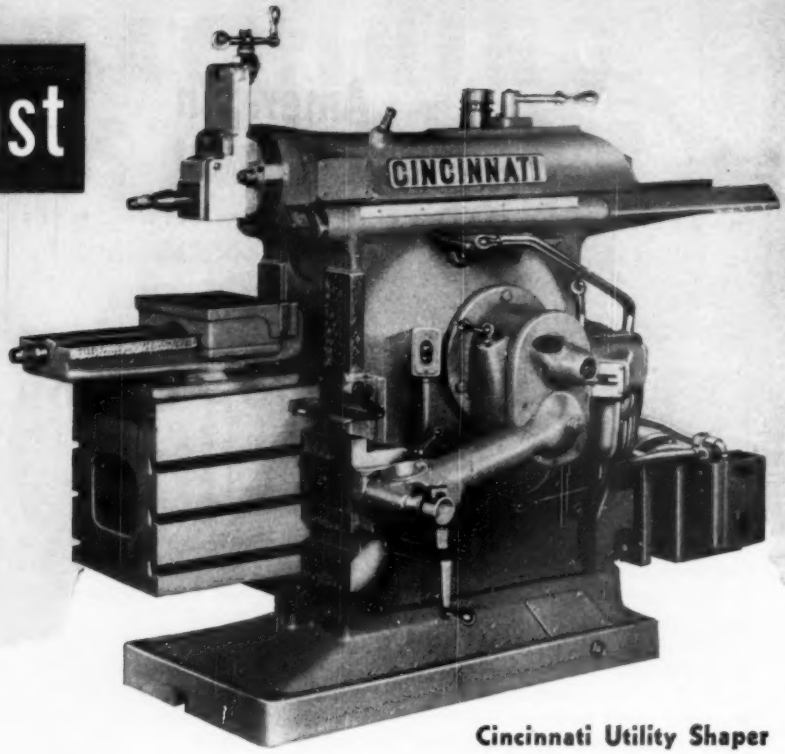
WHY THIS RECITAL? Because no other nation, viewing our vast and unequaled resources, is likely to go lightly into a major war with us.

Even the most successful sneak attack upon us could destroy or damage only a minute fraction of these resources. Brought into full play against an enemy, these resources can spell disaster for America's foes.

That is why we are potentially strong today despite our obvious military weakness at the moment. It would be a gross error for anyone to let our poor showing in Korea up to now obscure that fundamental fact.

Burnham Finney

low cost



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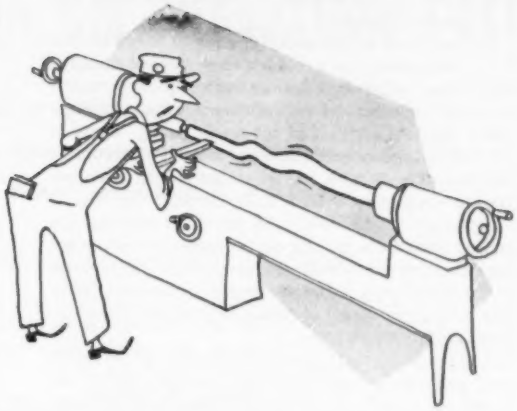


WHAT CAUSES DISTORTION IN MACHINING ALUMINUM?

Avoiding distortion in machining aluminum-alloy forgings and castings is not hard when you know the causes and the simple steps to avoid them

BY DR. K. R. VAN HORN, Assistant Director of Research, ALUMINUM COMPANY OF AMERICA

UNEXPECTED changes in dimensions of considerable magnitude are sometimes encountered in aluminum-alloy forgings or castings during machining. Such distortion may result from a number of different causes: (1) overheating of the part during machining, (2) redistribution or relief of the residual stresses induced by heat treatment, (3) growth resulting from an advanced stage of precipitation in the alloy, and (4) *overloading or elastic deformation of the part in the chuck or fixture.*

OVERHEATING

Careful consideration should be given to cooling the part during machining operations if precise dimensions are to be attained. Aluminum alloys expand approximately twice as much with increasing temperature as do iron or steel and, therefore, adequate cooling practices should be employed. For example, a 10-in. length of most of the commercial alloys will expand about 0.01 in. at 150 F, 9.93 in. at 300 F, and 0.06 in. at 500 F. The part, of course, returns to its original dimensions at room temperature. This may cause difficulty in precision operations if temperatures are not properly controlled.

STRESS REDISTRIBUTION

One of the causes of distortion on machining is the partial relief or redistribution of the residual stresses existing in the part. The extent of the dimensional change from this source is usually of a much smaller magnitude than is generally supposed, but may be considerable. Residual stresses may be induced by various operations which impose stresses exceeding the yield strength of the alloy, or by quenching of the part from a solution heat-treating operation.

Stresses previously introduced from working operations are *removed during* solution heat-treatment, so stresses in a part so treated are *only those caused by quenching*, provided there is no subsequent cold working such as straightening. The magnitude of the residual stress produced by solution heat-treatment depends upon composition of the alloy, heat-treating temperature, temperature

and nature of the quenching media, and upon size or shape of the part.

Temperature of the quenching medium is particularly important, as a cold-water quench induces high stress, whereas a boiling-water quench results in a very low residual stress. Consequently, a boiling-water quench is specified for many parts. There is the difficulty, however, in large masses of metal, or sections over 3 to 4 in. in thickness, in securing desired properties with a boiling-water quench.

Although extensively used for most forging and casting alloys, the boiling-water quench is not practical for a quench-sensitive alloy such as 75S because of the sacrifice in ultimate tensile properties. With this alloy, the other precautions stressed here become doubly necessary.

A high-strength alloy exhibits higher stress levels upon quenching than do lower strength alloys. As an example, drilling a 1-in. hole in a cylinder 3-in. dia x 10-in. long of the high-strength alloy, 14S, that had been quenched in cold water may cause an increase in length of 0.003 in. After a boiling-water-quenched cylinder is drilled, the increase may be only 0.0001 in.

A similar cylinder of the medium-strength alloy, A51S, quenched in cold water, would extend 0.0015 in. after drilling, and about the same amount as 14S if a cylinder quenched in boiling water is drilled.

It must be concluded from these and other extensive data that the changes in dimensions on machining resulting directly from redistribution of stress in many types of forgings and castings are much smaller than is commonly believed.

WARPAGE

Often the residual stress level may be of a relatively low order, but substantial warpage may occur during machining or removal of the part from the clamping device. This warpage is influenced by the design or size of the part, as from a large variation in sectional thickness or width-to-length dimensions, or from the *character and sequence of the machining operations.*

In such cases, intermediate straightening may be necessary, and it would be preferable to avoid machining to finished dimensions from one side only. An attempt should be made to balance the machining operations, leaving sufficient allowance to compensate for any final straightening found necessary.

Complete redistribution of the residual stresses which cause warpage on machining is not necessarily completed upon removal of the part from the fixture, but may continue at an appreciably diminished rate over a period of several days. Such further changes are usually of a minor magnitude compared to those occurring during machining or on releasing the casting or forging from the clamping device.

Occasionally questions arise regarding the extent to which residual stresses can be removed by artificial aging, or particularly by stress-relieving anneals. Ordinary artificial aging treatments of about 10 hr at temperatures from 310 to 340 F relieve only from 10 to 25% of residual stresses, depending on the alloy.

It is necessary to employ temperatures from 450 to 550 F to reduce greatly the level of such stresses, and long times are required which appreciably decrease the tensile properties. Again the composition of the alloy influences the relief which can be gained through such treatments. Tests indicate that a treatment of 10 hr at 500 F will relieve 30 to 40% of the residual stresses in alloys of the B18S and 142 type, whereas 80 to 95% will be removed in alloys of the 25S, 195 and 355 types. Therefore, it is difficult to obtain appreciable reductions in stress without substantially decreasing the properties, and the best practice is to obtain a low stress level by the selection of the proper quenching and machining practices whenever practical to do so.

PERMANENT GROWTH

Distortion or change in dimensions of parts as the result of permanent growth in aluminum alloys is thought, by some, to occur on standing at room temperature or on reheating to temperatures up to 300 F. Growth is caused by an advanced stage of precipitation of constituents in the alloy, and *definitely does not occur at room temperature.*

No significant changes in dimensions have been detected in aluminum alloys from growth at room temperature, or at any temperatures up to 300 F. Even at 400 F, some of the alloys show no tendency to grow, whereas a 10-in. cylinder of most alloys may change 0.001 to 0.002 in. in length, and the maximum might be 0.007 to 0.008 in. Thus, the tendency to grow at elevated temperatures is greatly affected by alloy composition. Extensive data show that the tendency to grow is not a source of change in dimensions on machining, or standing at room temperature.

OVERLOADING

Probably the *largest source of distortion* (excluding warpage) in many machining operations is introduced by fixturing or chucking the part in such a manner that it is elastically deformed or sometimes even stressed beyond the yield strength. There is a tendency of some machinists to tighten various clamping devices excessively without giving adequate consideration to the lower modulus of aluminum alloys compared to steels.

High stresses can be imposed by this means which may be redistributed in subsequent machining operations. If the part is overheated during machining, the yield strength is reduced by the temperature and, furthermore, the strains imposed by the fixture would be proportionately higher. The distortion occurs during machining or upon removing the part from the fixture. Considerable experience in the field has shown that more distortion or change in dimensions in forged and cast aluminum-alloy parts has resulted from this than from any of the other sources described.

How Management Can Cut Production Cost

Costs largely influence an organization's measure of business success — assuming adequate financing and product market. A cost-reduction program that improves every method, process, and product by a definite percentage is practical

BY GEORGE F. CLIPSHAM, Asst. to the President, THE LINCOLN ELECTRIC COMPANY, CLEVELAND

DETAILS of the solution to the problems of cost reduction will vary depending on the product and the size of the organization. The general form of the solution, however, will in all cases be essentially the same.

It is vital that steps be taken by the management engineer to focus the attention of *every department* on the necessity for reducing production costs. This applies not only to actual product fabrication in the shop, but to all clerical and administrative activities, as the expense of these is a very definite part of the product cost.

Nothing is more disheartening to a production man striving to cut a few cents off his various shop costs than to know, or suspect, that little or no attention is being given to reducing office expense. The expense involved in office paper work as an order is handled from the time it is received until the order is executed, and payment received, is important. It is just as important as it is to know the expense of machining a particular part of the product.

Cost-reduction measures, to be effective, must first of all be stated in terms of quantity and time. For certain types of product, the bull's eye might reasonably be a 10% cost reduction in a year's time. But irrespective of product, without both quantity and time definitely stated, the program will be ineffectual.

Areas of Cost Reduction

Product design, plus fabrication methods and processes, are generally the sphere of operation in which the problems of reducing cost can be most readily attacked.

The first requisite is that the design is such that the product properly fulfills its intended function. Once this basic requirement is accomplished, the designer can turn his attention to the manner in which the product can be most economically produced. He must be thoroughly familiar with all of the production equipment which his company has in operation, or available for use. (*AM*, May 15, 50, p. 114)

The design engineer, methods and process engineer, and materials engineer should cooperate closely to provide a unified cost-saving effort. No design should receive a final okay until it has been judged and approved by the fabricating department from the point of view of economical production.

Much time and expense can be saved by suggesting modifications in design *as the design is in progress*, rather than waiting until it is completed. This, plus the direction of changes in production methods and processes which may not involve design changes, is an important function of the methods and process engineer. He must have a wealth of practical fabricating experience, plus some knowledge of design principles. His responsibility is to make certain that each part is designed to be fabricated at minimum cost, with existing shop facilities; also to recommend new equipment which will lower production costs.

New, or different, materials may offer an even greater cost reduction than redesign or retooling; may make these more economical. This possibility has led to the use of an engineer who, for want of a better title, is called a materials engineer. His job is twofold. First, and foremost, to keep abreast of new materials developments, he combs technical and trade journals, attends technical society meetings, trade exhibitions, and explores all possible sources which lead to new or different materials which may offer cost reduction. Then, he discusses with suppliers and vendors means of reducing their costs to enable them to quote lower prices.

Management takes part

The key individuals in any cost-reduction program should be given considerable latitude within their assigned sphere, including the responsibility to produce results.

Imagination is, perhaps, the most needed characteristic in cost reduction work. Unfortunately it is all too scarce as far as most people are concerned. Nevertheless, each of us has some measure of it and this is capable of development. That development is one of engineering management's more-important duties. Remember always, "Every method and every process which we are employing today can be improved."

Less than half of the average person's ability is put to work. Therefore, in any group of people, there is a vast amount of latent ability which, if employed usefully, would produce astonishing results. Incentives of increased earnings and *incentives of recognition* will develop and encourage this ability. The latter, particularly, is not often utilized to the fullest extent of its inherent quality of encouragement.

Put the man in business for himself—create a cooperative group of private enterprises—with Management and Men on one side of the bargaining table; only the customer's interest on the other.

PHOTO-TEMPLET PROCESS CUTS

Sharp, clear reproductions of drawings or photo negatives are made on sensitized steel, Masonite, or even cloth in 15 minutes in the aircraft industry, where templets are the key to production. The process for making the sensitized stock takes less than 3 hours, costs under 14 cents per square foot, requires no expensive equipment

BELL engineers studied several photo-templet reproduction processes during the summer of 1949, and came up with a method they developed themselves that costs only 13½¢ per sq ft of templet, as compared with an average of 50¢ for most other processes. As proof that the process is good, test templets made then and exposed to daylight every day since are still sharp and clear. Templets can be made from any tracing or negative, but best results are from drawings on Fiberglas sheet made with 4H pencils.

Base material for the templets is usually zinc-coated, mild-steel sheet, 0.051 in. thick, which can be utilized to make several thousand parts. To keep the stock flat and in good condition, it is stored separately from other stock.

A gallon of the emulsion base, developed by Keuffel & Esser Company, is mixed with 505 grams of ferric organic salts and 52 grams of potassium-ferricyanide. Although this mix will keep, sealed, for a few weeks, it is normally applied the same day. Stock is primed not later than 4 hr after cleaning, and the emulsion is applied with a cup gun to prevent contamination. After drying, the emulsion will stand considerable abuse, and can be handled on a ball table.

Shearing the stock is done so burrs will be raised on the uncoated side. Otherwise, the burrs might cut the drawings. The sheets are handled with a double-hook hoist rack that has end rollers for guides. The rig lifts stock from the drying room on the ground floor to the reproduction room overhead.

Exposure is made on a wood-frame table that holds a 4x12-ft sheet of frosted (for light diffusion) plate glass. Ultra-violet fluorescent lamps 4 ft long are mounted 2½ in. below the glass on 2½-in. centers. They are timed automatically.

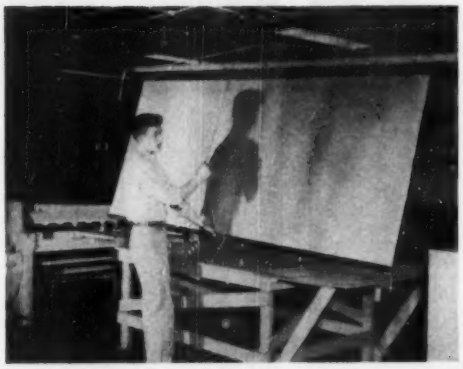
To insure firm, even contact of the negative or drawing against the plate, a rubber blanket made of rubber floor matting is rolled over the plate and the edges are sealed down with gum-rubber strips. Evacuating the space under the blanket to 20 in. of mercury forces it against the stock.

1 **. . Degrease** *in trichlorethylene-vapor tank for several seconds*
2 *. . Dip for 30 sec in Oakite-61 solution*
3 *. . Dip in hot-water rinse*
4 *. . Dip in chromic acid (5-10% solution)*
5 *. . Dip in hot-water rinse*
6 *. . Air-dry on A-frame, then move to paint booth on floor truck*

7 **. . Spray** *one side with light coat of No. 10 Strathmore zinc-chromate primer, then air-dry for 30 min*
8 *. . Spray-prime side with opaque K&E white lacquer, then air-dry for 30 min*
9 *. . Store in paint shop until needed*
10 *. . Spray sheet in horizontal position with heavy coat of mixed sensitized emulsion, then dry under infra-red lamps*
11 *. . Raise plate to photo-templet room with guided elevator*

PRODUCTION COSTS

BY E. C. LONG, PRODUCTION ENGINEER, BELL AIRCRAFT CORP.



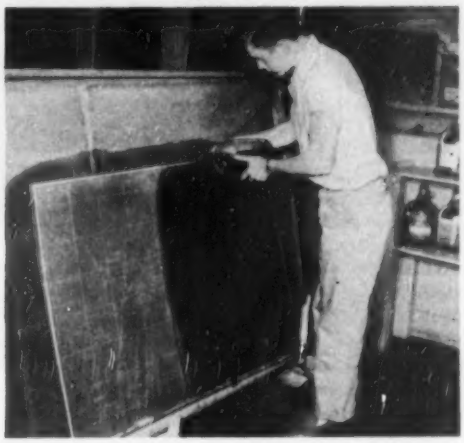
12 . . Cut sheet to size on shear table with emulsion-side down

13 . . Locate drawing on light table, then templet sheet on top with emulsion-side down

14 . . Roll rubber blanket over table, start vacuum pump, then expose lights for 5 to 8 min, depending on condition of emulsion and clearness of drawing

15 . . Remove rubber blanket after timer shuts off lights and pump

16 . . Transfer templet sheet to washrack, then hose with water to bring out image and remove excess emulsion



17 . . Fix sheet with 10% potassium-dichromate solution from bottle

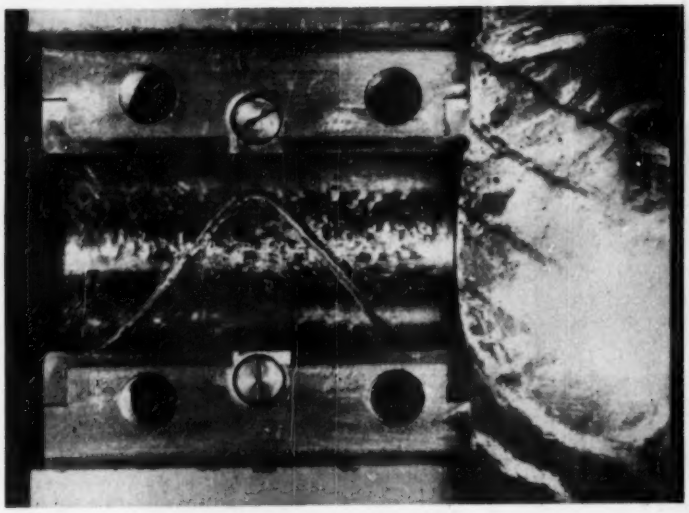
18 . . Rehose with water to remove fixative

19 . . Air-dry for 1 hr, or dry quickly with infra-red lamps

20 . . Spray sheet with clear lacquer for protection

21 . . Cut templets from sheet with bandsaw, then file and grind to size and shape

1



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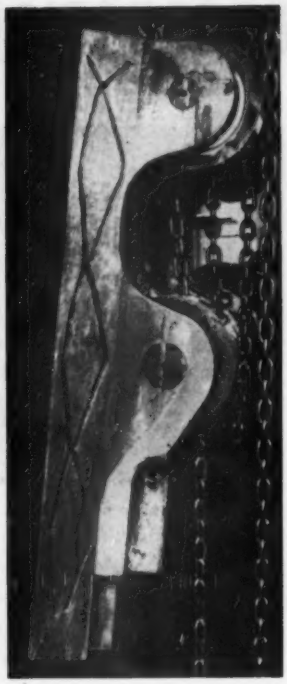


TWICE THE HITS BUT NO WEAR..(1) Crankshaft bearing of blanking press shows the value of close bearing alignment and adding an oil groove. (2) Scraper marks on the slide-bearing surfaces of the ram are fully visible. (3) Slide surfaces under the gibs of the horning-press frame are slightly darker, but otherwise do not differ from the working surfaces. (4) With bearing area as good as new, the horning-press ram is ready for much more service

PRESS RECONDITIONING PAYS OFF

BY C. E. BLASS • MANAGER OF PLANNING, TALON, INC.

Our die-interchangeability and press-reconditioning program (*AM*—p100, June 26, 1950) has paid off.

Two of the presses overhauled during the past four years under this program were removed from production for reconditioning, in the expectation that sufficient production time had passed to warrant the procedure. This is what we found:

No discernible wear was discovered in either the crankshaft bearings or the bearing areas of the slide and ram of a 15-ton blanking press, even though it had been operated 56,400,000 strokes.

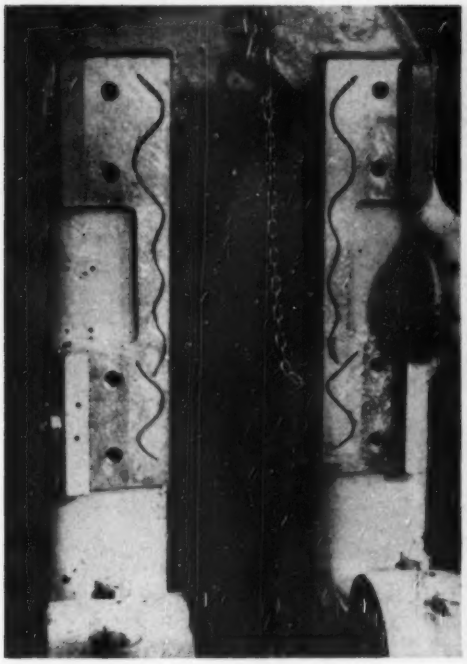
The same was found true for the bearing surfaces of the slide and ram of a 400-ton coining press, which had been operated for 41,500,000 strokes.

Our cost records prove that use of reconditioning standards rather than conventional overhaul practices is worth the extra expense. In the case of the blanking press, reconditioning cost $4500 as compared to $3000 for an overhaul. Things done to the press included: The crankshaft frame was bored out to bring the bearings into line within a tolerance of 0.002 in.; they had been out of line 0.022 in. The slide was brought to within 0.001 of alignment. All bearings were scraped to a 70% contact area. Oil grooves were milled into the crankshaft bearings and the slide bearings of the ram.

It may seem ridiculous to you, but a good reconditioning program may extend the life between overhauls by ten times. We have already obtained twice as many pieces from the blanking press as previously obtained from the conventional overhaul. Certainly, as there is no wear now on the press components, we might well get 250,000,000 impressions before the next reconditioning is necessary.

The reconditioning of this press to close tolerances for alignment, good bearing areas, and minor changes in lubrication has paid off in more ways than extension of service life. The speed of the press was increased 60% by these modifications. The effective increase in daily production was 220%, because close tolerances on alignment permitted effective interchangeability of expendable tools, the breakage of tools during setup was eliminated, and downtime was decreased. Unit tool costs have been reduced 65% within the past three

3



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years, because of lower tool breakage. And this figure has been realized despite rising tool costs.

Reconditioning of the horning press increased the speed 30%, the productivity 50%. Tool breakage and tool costs were reduced in proportion. The most remarkable change in operation of this equipment is the reduction in noise level. Before being overhauled to our new standards, the press sounded like a nail factory. Since then, one can carry out a normal conversation while standing right next to the machine. The only noise produced is when work is being done, and no longer from the equipment knocking itself to pieces.

The only de ~ble change in the horning press, as far as we could see from teardown, is an outward bearing for the main crankshaft. This shaft carries a heavy flywheel and integral air clutch on one end. Hence, line wear is produced on the lower right bearing and on the upper left bearing. It is expected that this modification will extend the service life for two to five times the extended life already obtained by reconditioning. Further, this change should minimize or eliminate high tool costs resulting from lack of alignment and uneven wear.

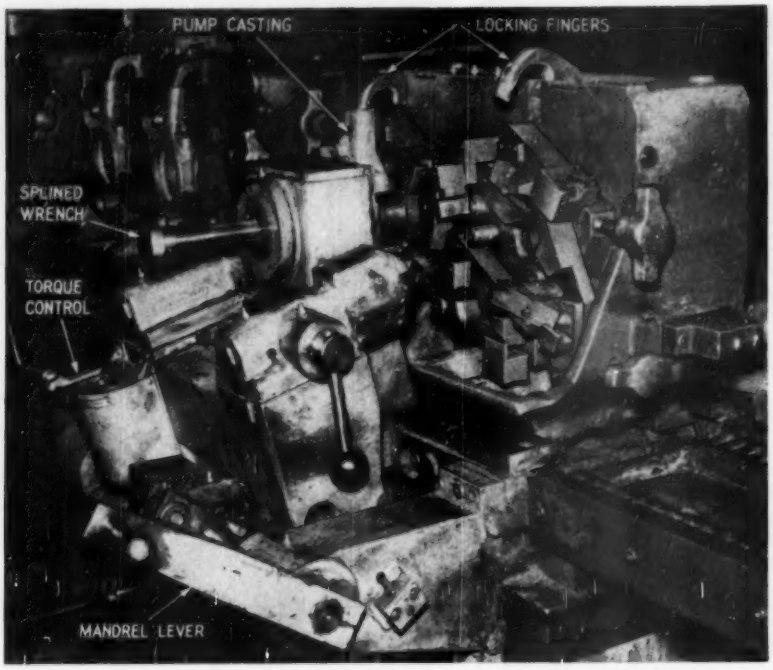
The problem of determining the economic limit of press refinement is best resolved by the simple equation of unit costs as determined by overhaul cost divided by production life. The blanking press mentioned is a good example of the manner in which we arrived at how far we could go on improving press performance. We are well satisfied that we have not reached the point of diminishing returns.

Our company, as well as many others, is faced with a higher degree of product development to meet increasingly competitive conditions. One demand of our markets has been for greater precision. In our product, this takes the form of a smaller, lighter and more precise product. Each time we introduce a smaller size slide fastener, it means that the material and product specifications are proportionately tightened.

Progress in product refinement is made possible only by the greater precision made available through equipment refinement. In all discussions relating to press refinement, this requirement resulted as a byproduct rather than as a compelling force in the program. We have not attempted to evaluate in dollars and cents the importance of this feature as it relates to our operation. It naturally has a corollary in that press equipment refined to this point makes the resulting product more adaptable to statistical quality control, and resultant savings in inspection costs.

This program of refining equipment design for lower tool costs and higher productivity has been extended to all of our metalworking equipment. It is gradually being extended to assembly equipment where additional factors require different treatment.

Our next step is the practical determination of the most effective equipment-overhaul service life. This program, when extended to assembly equipment in which material variations and manufacturing conditions do not permit of the exact controls available to our metalworking operations, will permit of eliminating equipment as a variable in quality control of a product.



To locate the water pump casting in a fixture recess, the outlet is slipped over the locking finger and pressed back into the nest against three locating buttons that bear upon pads

BUICK USES POWER-CLAMPED FIXTURES

Worker complaints are reduced and production is increased

when the tool engineers have a free hand to devise fixtures that are easily operated

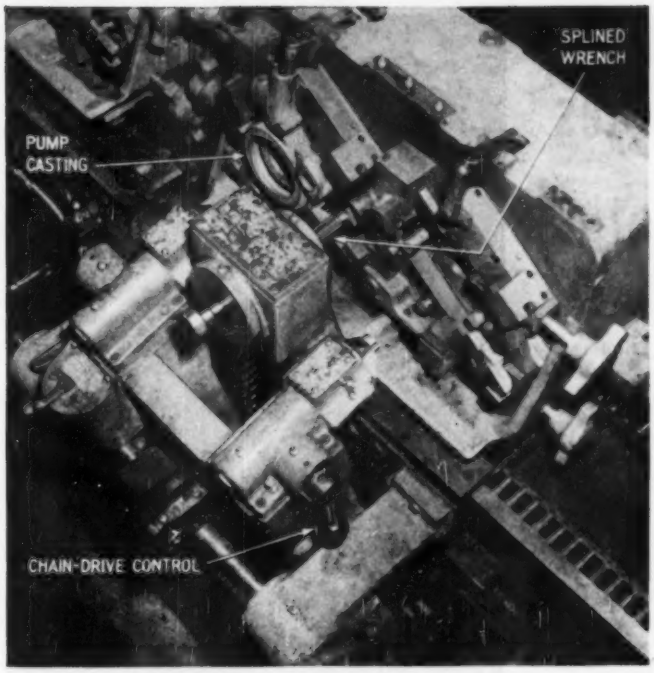
BY JESSE L. POWERS,
Superintendent,
Motor Plant, Buick Motor Division
GENERAL MOTORS CORPORATION

GRAY-IRON water pump castings for Buick engines are now machined in two-position fixtures that are power clamped at the loading station of a fully automatic, station-type Greenlee machine. The operator need only place castings in the fixture recesses, throw a lever to center the parts by means of expanding mandrels, engage a power screw feed to actuate the fixture clamps, then withdraw the power clamping wrench and the mandrels.

T-handled screws shown on the sides of the fixture are not used. The power clamping has proved entirely reliable and capable of equalizing clamping pressure for the two parts in the fixture. Production workers have always objected to using hand wrenches on fixture clamps. The power-operated fixture clamp has eliminated this potential source of friction and makes it possible for the loader to keep in pace with the machine.

Twenty fixtures are kept in use constantly by the Greenlee. After being loaded and clamped the fixtures are indexed automatically to successive stations, where they are pin located and locked. Tools advance, make their cuts and are retracted at the various stations. Then the fixtures are again indexed one station. The only direct labor required consists of the services of three men who do the unloading and loading, as compared with ten men for these tasks before installation of station-type equipment.

Castings are loaded from tote boxes. When water pumps are removed from the machine they are hung on a chain conveyor that passes through a washing machine to remove chips before reaching the assembly station.



To clamp the castings the splined socket wrench is pushed into the screw shaft at center of fixture and the chain drive is engaged to tighten the screw with the proper torque

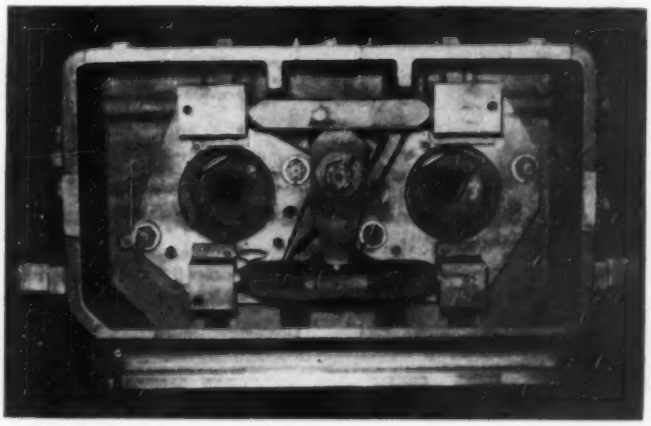
A power clamping unit is placed at the loading station of the machine and an unclamping unit is situated at the unloading end. As the chain conveyor loop under the machine brings a washed, chip-free fixture back to the loading operator, he sets water pump castings into the recesses. Each casting is held loosely in place by a curved locking finger situated at the top of the fixture. Next the operator throws a lever which advances expanding mandrels to center each water pump casting in its fixture recess.

To lock the parts in place with clamps on each side, of the piece, the operator pushes the spline-shaft socket wrench onto a central screw in the fixture. A lever is thrown to engage a chain drive for the splined wrench, the torque of which is controlled by a controller at the front of the clamping device.

As the screw is tightened, an equalizing mechanism at the rear of the fixture causes the curved locking finger in the water-pump outlet to tighten down and clamping elements at right and left of the part to advance. Proper location of the pieces is established by the contour of the clamping elements and by three locating buttons set into the rear of the fixture recess.

Each fixture has a heavy cast box-like frame that serves as a rigid supporting member for all other parts of the assembly. The base is cast integrally with the frame and is machined to fit the track of the Greenlee machine. Holes are drilled in the frame for the pin locators incorporated in the machine to establish the correct machining location at each station.

By changing the clamping details of these fixtures, Buick is able to run through the machine another water pump that differs slightly from the one illustrated.



Equalizing members with ball ends (at rear of fixture) rock the locking fingers down into the water pump outlets and bring clamps to bear on two sides of the castings

Huge Forming Dies Simplify Production of Welded Pipe

BY BEN C. BROSHEER, ASSOCIATE EDITOR

PHOTOS COURTESY U. S. STEEL CORP.

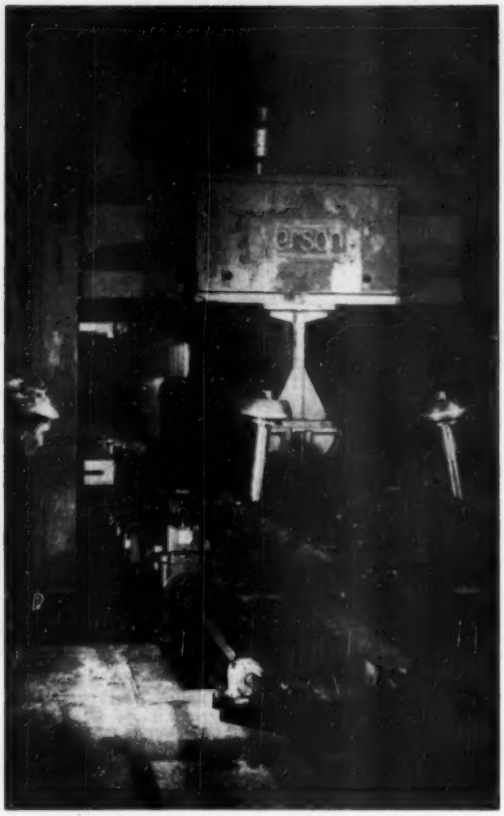
HEAVY postwar demand for large-diameter welded steel pipe, used for long-distance transmission of gas and oil, has led several suppliers to initiate major expansion programs. Most recent of these mills to go into production is the new electric-welded pipe mill of U. S. Steel's National Tube Co. at McKeesport. Here pipe lengths 24 to 36 in. OD, 40-ft long are formed, welded and sized from ¼- to ⅝-in. steel plates.

Automatic handling devices transfer the plates and pipe sections from station to station along the production line, where nine operations are performed in making a finished pipe length. Work done by operators of the equipment in most cases is limited to the manipulation of switches and push-buttons at console-type control stations.

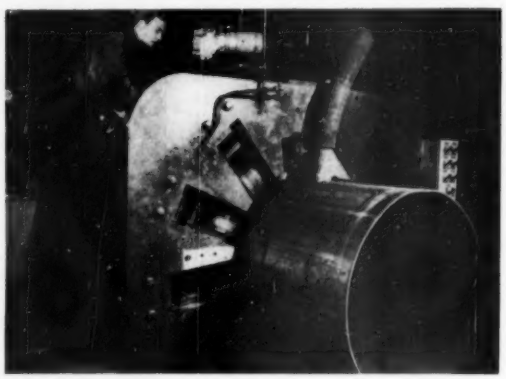
Adjustable dies are used here for the first time in forming pipe of these sizes. Developed by Verson Allsteel Press Co., the punch and rocker-action die used in the U-forming press will form all thicknesses and all diameters by merely changing spaces. There are no die inserts to change.

The Verson-designed closing dies used in the finish-forming press consist of a set of master shoes and interchangeable inserts for each diameter. These half-round inserts are made slightly undersize, so after the edges of the plate butt together, and full pressure is applied, the material will set and springback will be minimized.

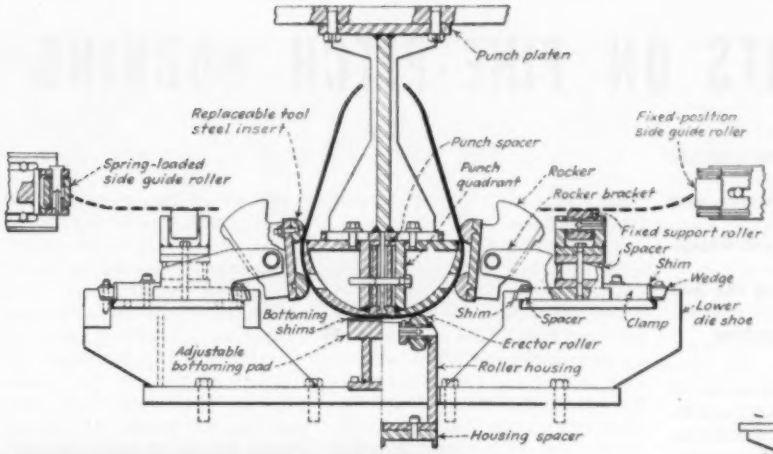
Steel plate used at National Tube for making this large-diameter pipe has an ultimate tensile strength to 70,000 psi and an extremely high springback index, making it necessary to overbend the plate in all three press forming operations—edge forming, U-bending, and circular forming. Final sizing and pressure testing of the welded pipe sections are performed by hydrostatic stressing in cavity dies.



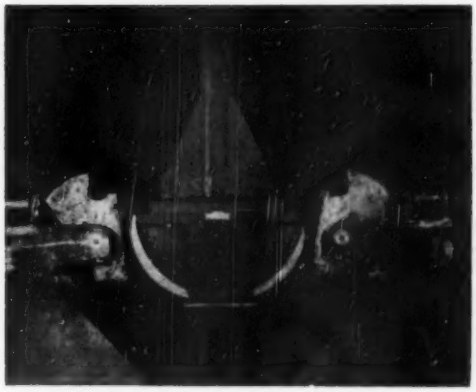
Edge-formed pipe plates are preformed to U-shape in special 2,000-ton Verson hydraulic press, using adjustable punch and die assembly. To reset tools for forming another pipe diameter, only spacers need to be changed

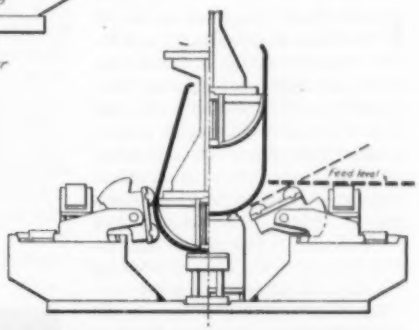


Two submerged-arc welding operations close outside and inside edges of longitudinal butt-weld joint in pipe plate after circular forming is completed. Heavy rolls guide continuously moving pipe under Unionmelt head

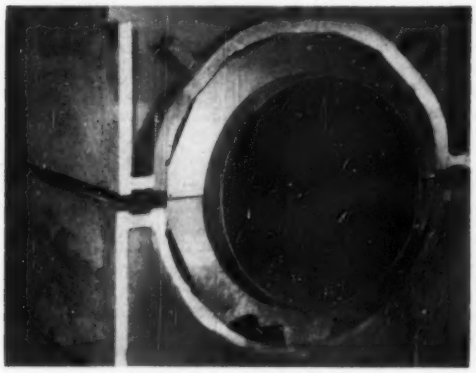


Support and side-guide rollers are built into rocker-type preform die so edge-formed pipe plate easily can be located in 89½-in. wide, 492-in. long die from conveyor at end of press. Punch, die, and side-guide roller easily are adjusted for plate width and pipe diameter. Dies are made in 24-in. sections lengthwise for easier handling in case of repairs





Rocker die members in U-forming press roll pipe plate around punch in making preform. Punch bottoms work against pad in center, depressing four ejector roll units to pad level. When punch returns, die rockers swing back out of way and ejectors lift workpiece to conveyor height, so it can be pushed lengthwise out of press



Closing dies consist of a set of welded steel master shoes and interchangeable inserts made slightly undersize so material is set to minimize springback when full press pressure is applied. The 492-in. long dies are made in two 246-in. long sections for ease in handling

Preformed pipe plates are closed to circular shape in a 18,000-ton HPM hydraulic press, made up of three 6,000-ton units in line. Dies have interchangeable half-round inserts which are changed for each pipe size. U-shaped preforms are fed into press by transfer conveyor

HINTS ON FINE-PITCH HOBBING

Ultra-fine precision, increasingly demanded for instruments and timing devices, requires exceptional care in checking the hob and setting up the machine

BY FRED BOHLE, Chief Engineer, ILLINOIS TOOL WORKS

FINE-PITCH gears—those of 20 DP and finer—present a difficult manufacturing problem because the degree of accuracy demanded is far beyond even the most exacting requirements for ordinary pitch gears. On the latter type, it is possible to control inaccuracies in tooth form and spacing as small as 0.0005 in., and furthermore, if this is not satisfactory, accuracy can be improved by shaving, grinding or lapping.

An error of 0.0005 in. on a 9 DP gear represents only one-third of 1% of its tooth thickness, but even a 0.0002-in. profile error on a 120 DP gear is almost 2% of its tooth thickness. Moreover, none of the usual additional finishing operations are possible on really fine pitch gears. If their accuracy leaves something to be desired, there is only one thing to do—make the cutting process more accurate.

Most fine-pitch gears are hobbed, and to meet precision requirements both machine and hob must be accurate. However, inaccuracies in the hob will have their own influence on the shape of the gear teeth, over and above any errors introduced by the machine. From the standpoint of accuracy, therefore, it is most important that all teeth on the hob be correctly aligned along the helix, and that tooth profile be accurate. A deviation from nominal pitch angle, or straightness of the hob-tooth profile, produces faulty involutes in the same manner as an error in the helical arrangement of the teeth.

However, profile errors can be held within closer limits than lead errors. An accompanying table gives allowable limits for these and other errors in the manufacture of fine-pitch hobs.

The total number of finishing teeth in a hob cutting full-depth involute teeth seldom exceeds two convolutions for each side of the gear tooth. Since lead errors caused by progressive deviation, weave, gash spacing and runout are additive, the table shows limits for the accumulation of all errors over three convolutions—more than will be active in finishing any profile.

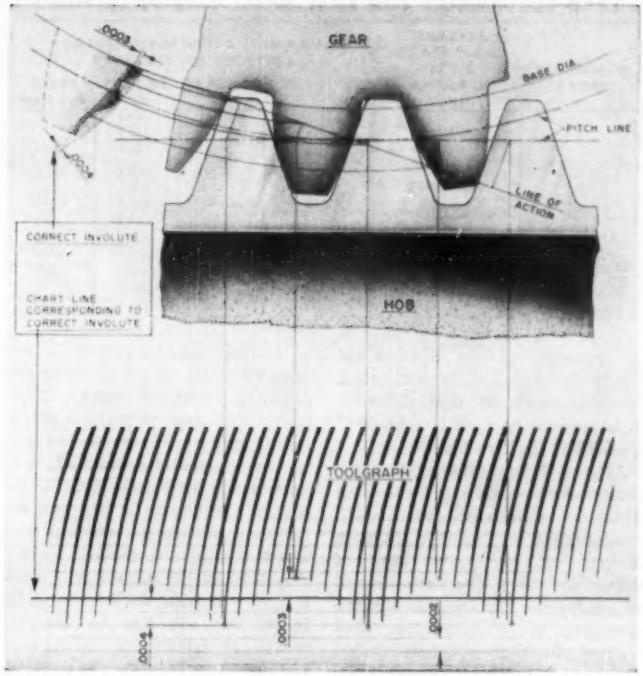
Hob accuracy is one of the most vital factors in fine-pitch gear production, and special inspection procedures are necessary to insure it. One manufacturer has developed an electrical recording system to produce a "Toolograph" chart which automatically records hob accuracy with high fidelity and obviates the necessity of the customer's purchasing special equipment for making a lead check. Each peak on the chart marks the exact location of the cutting edge, and the succession of peaks records the relative position of the cutting edges along the helix. Profile, tooth thickness and depth, and hole and runout tolerances can be checked by microscope or projector, using the same procedure and equipment as for checking the finished gears.

Multiple-Thread Hobs

On fine-pitch gears it is particularly profitable to take advantage of the faster cutting action of mul-

TOLERANCE CHART FOR FINE PITCH HOBS

PITCH			20-29.99	30-50.99	51 and Finer
THREAD	Lead variation in one complete turn must not exceed	CLASS A	.0004	.0003	.0003
		CLASS B	.0007	.0004	
		CLASS C	.0010	.0008	.0006
	Tooth to tooth	CLASS A	.0002	.0002	.0002
		CLASS B	.0003	.0002	
		CLASS C	.0004	.0003	.0003
	In three turns	CLASS A	.0007	.0005	.0005
		CLASS B	.0010	.0007	
		CLASS C	.0014	.0012	.0008
TOOTH PROFILE	Straight portion within	CLASS A	.0002	.0002	.0002
		CLASS B	.0003	.0002	
		CLASS C	.0003	.0003	.0003
	Start of approach within	CLASS A	.0040	.0030	
		CLASS B	.0050	.0040	
		CLASS C	.0050	.0040	
	Symm. of approach within	CLASS A	.0035	.0025	
		CLASS B	.0055	.0035	
		CLASS C	.0055	.0035	
	Tooth thickness	CLASS A	−.0010	−.0005	−.0005
		CLASS B	−.0010	−.0005	
		CLASS C	−.0015	−.0010	−.0010
SHARPENING	Indexing flute to flute	CLASS A	.0010	.0010	.0010
		CLASS B	.0010	.0010	
		CLASS C	.0010	.0010	.0010
	Accumulative error in one revolution must not exceed	CLASS A	.0025	.0020	.0020
		CLASS B	.0035	.0030	
		CLASS C	.0035	.0030	.0030
	Radialism for depth	CLASS A	.0003	.0003	.0003
		CLASS B	.0005	.0005	
		CLASS C	.0005	.0005	.0005
HOLE		CLASS A	+.0002 −.0000	+.0002 −.0000	+.0002 −.0000
		CLASS B	+.0002 −.0000	+.0002 −.0000	
		CLASS C	+.0003 −.0000	+.0003 −.0000	+.0003 −.0000
HUB RUNOUT	Face within	CLASS A	.0002	.0002	.0002
		CLASS B	.0002	.0002	
		CLASS C	.0002	.0002	.0002
	Diameter within	CLASS A	.0002	.0002	.0002
		CLASS B	.0002	.0002	
		CLASS C	.0004	.0004	.0004
RUNOUT O.D.		CLASS A	.0010	.0007	.0005
		CLASS B	.0010	.0007	
		CLASS C	.0015	.0010	.0008



Graphic record of hob helix variation, as produced on a Toolograph chart, shows by its peaks the exact location of each cutting edge. Shipped with each Class A hob, produced by Illinois Tool Works, it eliminates the need for further lead checking by the customer

tiple-thread hobs. The amount of metal removed is small, and the power and rigidity of the machine, which frequently limits the use of multiple-thread hobs on the coarser pitches, is usually well in excess of the cutting strains. The amount of feed per revolution of the blank is invariably small, and the use of multiple-thread hobs does not decrease the quality of the finish.

Multiple-thread hobs are not necessarily recommended on gears of 18 teeth and under. Nor are they recommended as general purpose hobs. However, they are the most efficient type for quantity production of gears of 19 teeth and over.

Multiple-thread hobs are fed at the same rate as equivalent single-thread hobs. Gear cutting time is therefore reduced in proportion to the number of threads in the hob. If sharpened and mounted to the same degree of accuracy as the single-thread hob, they will produce equally accurate gears because the original accuracy of multiple-thread hobs is in no way inferior to that of the single-thread.

The standard list of hob tolerances limits the extent of lead errors in any three convolutions—more than would be used in finishing a gear profile. The thread length of three convolutions in single-thread hobs is the equivalent of one and one-half convolutions for double-thread hobs, and one convolution for triple-thread hobs. The actual tolerance for accumulated error, however, remains the same, which means, as far as the effect on the gear is concerned, that multiple-thread hobs are as accurate as single-thread hobs.

The condition of the lead and thread spacing can be recorded in a Toolograph chart. The lead of one thread on one side of the hob tooth is first recorded, then the hob is indexed from accurate plates and the same record is repeated for the other threads. If the individual lead patterns were clearly offset against one another, it would be a clear indication of an error in spacing.

The weave tolerance or lead variation per revolution of the hob is the same as in single-thread hobs of equal pitch. The accumulated error on multiple-thread hobs is to be taken as the difference between the highest and lowest points on all threads within the number of convolutions specified for measurement. See accompanying table.

Sharpening and Mounting

As regards accuracy in the finished gear, the job of sharpening and mounting the hob is as important as the original accuracy. Serious errors are introduced whenever a hob runs out in the hobbing machine or when it has been sharpened with spacing errors.

If a hob is sharpened on an arbor which runs out and, as a result, is ground with an 0.0005-in. accumulated spacing error, that error will introduce a weave in the lead of approximately 0.0003 in. By the same token, if through faulty spacing on the part of the machine, an error of 0.002 in. in the spacing of two gashes is introduced, it will result in a tooth-to-tooth lead error of 0.0001 in. Errors such as these may add themselves to those already in the hob or those occurring later in the mounting of the hob and produce poor gears.

The tolerances given for the spacing of the gashes and the accuracy of the radial tooth face are entirely within the limits of the most exacting gear requirements. At the same time they are not difficult to live up to. They require true-running arbors, good indexing on the part of the machine, and care on the part of the operator.

Of equal importance is the mounting of the hob in the machine. Failure to appreciate the importance of runout and the particularly bad effects of certain types of runout, will not only nullify the original accuracy of the hob but will result in poor gears.

Runout may occur in three ways. To gain a real insight into the relative importance of each type, assume that a hob 1 in. in dia and 1 in. long runs out 0.0005 in. full indicator reading. If the runout is parallel with the axis of the hob,

it will result in a weave error of 0.0002 in. for a 20° PA hob, regardless of pitch. Supposing, however, one hub is found to run true while the other runs out 0.0005 in., the resulting weave error will be 0.0003 in. The worst effect is created when the two runouts are opposed, when the high points on the two hubs are 180° apart. In that case, even though the full indicator reading is 0.0005 in., it will result in a weave error of 0.0005 in. Such weave errors are serious because they copy themselves directly upon the involutes of the gear teeth.

Hub runout after mounting in the machine should not exceed 0.0002 in. full indicator reading. However, even at that figure it should never be found to be 180° opposed at the two hubs.

LEAD TOLERANCES FOR FAST INDEX FINE PITCH HOBS

NUMBER OF THREADS	ACCUMULATED ERROR TO BE MEASURED OVER		MAXIMUM ACCUMULATED ERROR BETWEEN ALL THREADS 20-29.99 D.P.	30-50.99 D.P.	51 D.P. and Finer
1	3 TURNS	CLASS A	.0007	.0005	.0005
		CLASS B	.0010	.0007	
		CLASS C	.0014	.0012	.0008
2	1½ TURNS	CLASS A	.0007	.0005	.0005
		CLASS B	.0010	.0007	
		CLASS C	.0014	.0012	.0008
3 and 4	1 TURN	CLASS A	.0007	.0005	.0005
		CLASS B	.0010	.0007	
		CLASS C	.0014	.0012	.0008
5 and 6	⅓ TURN	CLASS A	.0007	.0005	.0005
		CLASS B	.0010	.0007	
		CLASS C	.0014	.0012	.0008

After hobbing, fine-pitch gears are checked on rolling fixtures in which the gear is rotated through one complete revolution in intimate contact with a master gear of known accuracy. The variations in center distance during rotation are measured by an indicator. This type of check gives the combined effect of runout, pitch, tooth thickness and profile error.

Runout errors are usually due to poor holes in the gear blanks or eccentricity in the work-support spindle. It is relatively easy to tell which one is responsible. If these items appear satisfactory, the index gear may be suspected.

Tooth-to-tooth errors are somewhat more difficult to trace down. If the error is fairly uniform, then either the accuracy of the hob or the concentricity of the hob spindle is responsible. In cases where some tooth-to-tooth errors are larger than others, indexing of the hobbing machine may also share in the responsibility.

If sharpened properly, the original accuracy will be inherent until the hob is used up. Runout in either the hob spindle, the hob after mounting, or the work support spindle, can always be checked with indicators, and strict control of all these possible errors will undoubtedly result in excellent gears.

Maintaining the ultimate in precision in a production department, however, may prove to be costly. Even an AA tolerance hob is permitted a lead inaccuracy of 0.0002 in. Holding spindle runouts to less than 0.0002 in. on a daily basis also becomes a difficult matter. If the ultimate in gear accuracy is essential, it may pay dividends to resort to the cut-and-try method. This approach is indicated wherever the cost of the blanks is low and the hobbing time short—which is usually the case on fine-pitch gears.

A 0.00025-in. runout will cause a weave of from 0.0001 to 0.00025 in. If the hob has an inherent weave of 0.0002 in., it may be positioned on the arbor to counteract the effect of runout.

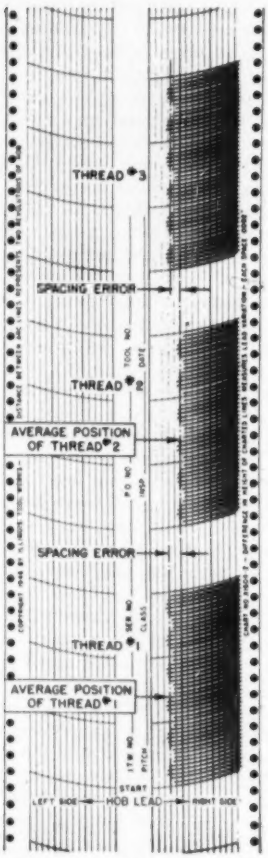
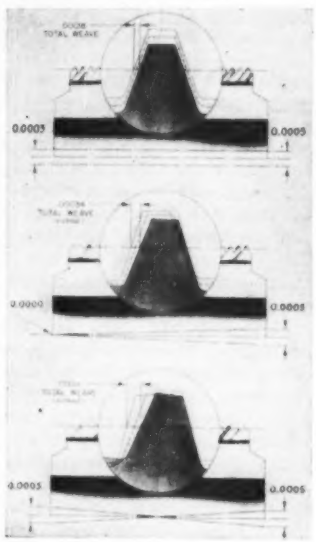
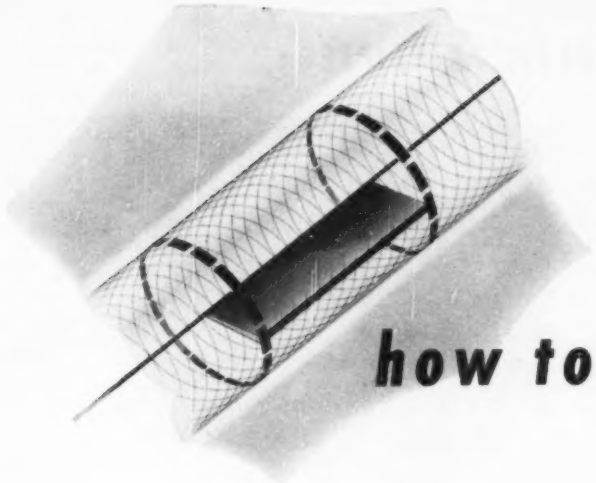


Chart record made from a finished gear shows the difference between individual tooth errors and those caused by runout. Operation is quickly performed with special machine available and permits production department to take the necessary steps to improve accuracy



Hub runout can produce three different degrees of weave, depending upon whether it is parallel to the axis, all at one end, or in diametrically opposed positions at both ends. After mounting in the machine, hub runout should never exceed 0.0002 in. full indicator reading



how to HONE

BY H. E. LINSLEY, ASSOCIATE EDITOR

CONSIDERABLE misconception still exists as to the proper function of the honing process in industry. This probably derives from the original understanding of the hone as a type of whetstone for producing a keen cutting edge—as on a razor. Furthermore, early industrial hones were so seriously underpowered that they were used only for fine surface finishing or polishing, and the belief still persists in some quarters that this is their principal purpose.

Actually, modern honing is definitely a stock-removing process which, under certain conditions, can compete favorably with boring or grinding, and in some cases can outstrip them. Moreover, it automatically produces straight, parallel and geometrically round holes to the finest limits of accuracy and surface quality. This accuracy is inherent in any properly designed and constructed honing head to which a combination of rotation and reciprocation can be applied.

Primarily, honing is a corrective operation which insures absolute circularity, straightness and size in a hole, but it cannot be used to change its location or direction. It is also used, although to a lesser extent, on external surfaces, either round or flat, but its purpose in these cases is surface refinement and dimensional accuracy, rather than heavy stock removal.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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BASIC PRINCIPLES •

HONING, whether internal or external, is a process wherein bonded abrasive sticks are applied to a surface under controlled pressure, and with a combination of rotary and reciprocating motions. Its function is the production of geometrically round and straight surfaces with a minimum of heat or disturbance of the crystalline structure of the material, and the production of accurate size. Honing also produces a type of surface finish unobtainable by any other method, and to any desired degree of smoothness.

Almost any material used in industry can be honed successfully, including glass and some plastics, but lead, babbit, and some of the softer brasses may give trouble with loading of the stones. The design of the honing head imposes a certain limitation on size, and the smallest hole known to have been honed is 0.100 in. in dia. At the other end of the scale, maximum bore size to date has been over 40 in., but this is not the limit, and hones can be built to suit any desired size. As regards length, there is virtually no limit, and machines have been built with a stroke of 75 ft and 75-hp motor for driving the hone.

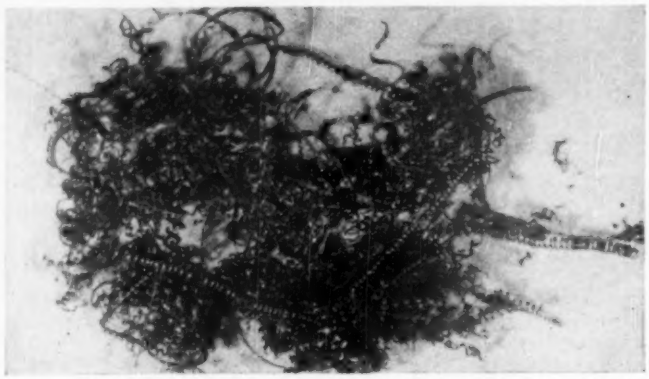
It must be understood that honing is a stock-removing process in which particles of metal are sheared off in the same manner as in any other machining operation. The chief difference, however, is that in honing there are thousands of tiny cutting edges at work, so unit pressures are low and little heat is generated. In a fine finishing operation, the chips are so small they look like dust, but on heavier cuts they can easily be seen to have the familiar curly pattern found in lathe chips.

Preparation for Honing

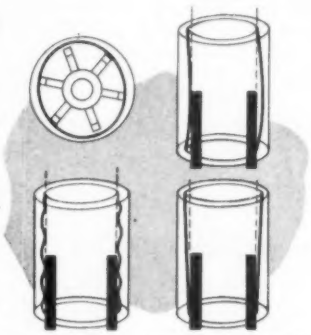
Generally, honing follows fine boring, reaming or grinding, when it is to be used merely for fine finishing and sizing. The stones remove the tiny ridges and irregularities left by the preparatory operations, and bring the whole surface down to the base metal. Because the stones are forced radially outward from the center of the tool with a constant pressure in all directions, the abrasive grits penetrate deeper into the tight, or out-of-round spots, and more stock is removed from that area. In this way, the bore is made round before any stock is removed from the large segments of diameter.

The hone or the work must be free to float so the tool can follow the original bore. The surface quality produced by the preceding operation does not affect the degree of finish developed by honing, but the finer it is, the shorter will be the honing time. Stock allowance in such cases usually varies between 0.0002 and 0.001 in.

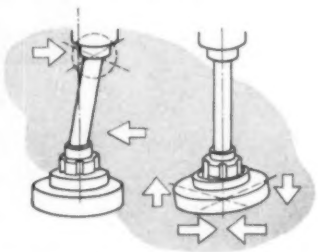
Increasing advantage, however, is now being taken of the rapid cutting action to remove large amounts of material, and in these cases a rough drilling or boring operation is all that is needed. It is not unusual to remove as much as 1/16 in. at a rate of 1½ to 2 cu in. per min, but if a fine finish is also required, the operation is preferably performed in two steps—roughing and finishing—with two different grades of stone.



Finely curled chips produced by honing SAE 1020 steel tubing show the stock-removing ability of modern honing equipment, and indicate that the process goes far beyond mere polishing



Stock removal always takes place first at the high spots, reducing these progressively until true circularity and straightness is attained. Inaccuracies are corrected without changing the location of the bore



Machine stability is not essential in honing. Either the tool may float (left) on two universals and align itself with a rigidly held part, or the part (right) floats on a rigid tool

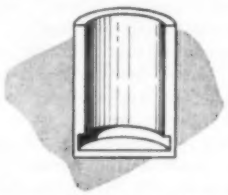
Drawn-steel tubing is often honed on the ID in the "mill" condition, that is, without any preceding operation. In long lengths, this is the only practical method of finishing, as the unavoidable spring in a grinding quill or boring bar makes straightness and roundness virtually impossible. Even in short sections, honing is frequently faster and cheaper than other methods, because the work can be held in the hand or in a simple fixture. It is not necessary to have perfect alignment between work and spindle, as the float will permit the stones to follow the neutral axis of the original hole. If close concentricity is required between the ID and OD, it is a simple matter to finish the ID by honing, mount the pieces on a mandrel, and then finish the OD by grinding. Stone consumption for a given stock removal is relatively low, based upon stone cost per bore honed, once the proper stones are worked out for the job.

However, this means actually trying out several hardness grades to determine which gives the highest stock removal with freedom from glazing, and longest stone life.

Quantity Production

On production work it may not always be most economical to remove large amounts of stock by honing, and it is frequently better to remove excess stock by boring, reaming or broaching. This roughing may be fast and not too precise, provided the location of the hole is accurate. Then discrepancies in the bore can be removed by honing, and final size and surface finish will be held to close tolerances.

In gear work it is common practice to rough hone the bore before cutting the teeth. The honed bore is then used for locating while cutting the teeth to insure concentricity. After heat treat the bore is finish honed, removing about 0.003 in. from the diameter. Because of the self-centering action of the honing tool, the final bore will retain the original concentricity with the PD of the gear. If excessive distortion occurs during heat treat, provision must be made by allowing more stock for final honing.



Undercuts should be provided at the bottom of blind holes for stone tip clearance. Otherwise, stones must be allowed to dwell for a few revolutions at the end of each stroke to avoid producing a taper

Honing Practice

In conventional practice, the stones pass over the entire length of the work at each stroke, and should project about one-quarter of their length at each end. This will insure enough over-run to produce straight, round, parallel walls without bell mouth. Sometimes, however, blind holes must be honed, and it is then desirable to have a recess at the bottom. This need be only a few thousandths larger than the finished diameter of the bore, but should be as long as possible. Where the recess is small, or nonexistent, the hone must be allowed to dwell for a few revolutions. If this is not done, the hole will be tapered at the closed end.

Rate of stock removal varies with the material and with the type of finish required (which is a function of the grade of stone), but on soft materials it is not unusual to remove 0.020 in. per min from the diameter, 0.015 to 0.018 in. on cast iron, and 0.006 to 0.012 in. on hard steel up to 65R$_c$. These figures are based on work 3 to 4 diameters in length. On long steel tubing, as much as 200 cu in. may be removed per hr.

Cutting Speed

It is highly important that the stones be kept cutting at all times to insure continuous breakdown of the grits and the bond, and to prevent glazing. The aim should be to obtain free cutting with a minimum of pressure and heat generation. Rotary speed, therefore, is somewhat critical. An accompanying table gives speeds recommended by one manufacturer, but it must be understood that these are only approximate and are given as a general guide. It is, however, simple to select the correct speed at which the stones will cut freely without glazing, and at the same time give a reasonable stone life. The squeal produced by the operation is the clue; too high a speed is indicated by a high-pitched squeak, accompanied by heating. Under such conditions the stones glaze and require more pressure to remove stock, and in extreme cases may cease to cut, especially on hard or close-grained materials. Too low a speed, which causes high stone wear, is indicated by a soft swishing sound, quite readily distinguished from the harsh cutting noise produced at the correct speed.

APPROXIMATE ROTARY SPEEDS FOR HONING

DIAMETER		ROTARY SPEED	
Hard Steel, in.	Grey Iron, in.	Roughing rpm	Finishing rpm
5/16	1	400	500
5/8	2	280	360
1	3	200	280
1 1/8	4	160	220
1 3/4	5	130	180
2	6	100	140
2 3/4	8	65	100
3	10	50	65
4	12	40	56
5 1/4	20	20	35

The faster the rotation, the less each abrasive grain will penetrate the surface of the work. This will make the stones act harder, slowing down the stock removal rate but improving finish and stone life. Too high a speed, however, or too hard a stone will cause glazing, and the work will heat up. Reducing the speed will increase stock removal, but will also increase stone wear.

Linear speed is less critical, but best results are obtained when stroke speed is so related to rotation that the stones move with about a 45° helix angle. This must, however, depend upon the conditions of each particular job, and in some cases a 20 or 30° helix may be preferred. Experience is the best guide, and it is sometimes possible to reduce honing time substantially by merely increasing the rate of reciprocation.

For holes which are short in relation to their diameter, stone

length must be reduced to obtain automatic dressing of the surface and maintain truly parallel bores. Stone length should not exceed one-half the length of the hole. The surface to be honed may be interrupted by holes or ports, provided these are short enough to be bridged by the stones.

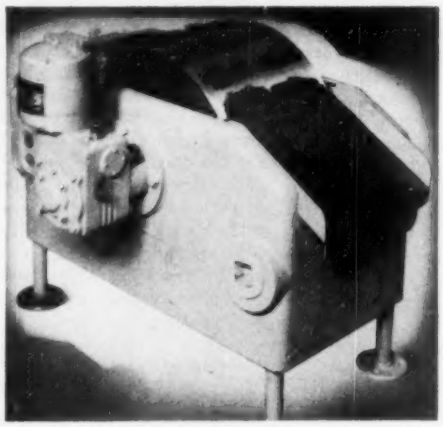
Abrasive Sticks

The stones commonly employed are molded in stick form from either aluminum oxide or silicon carbide, with a resinoid or vitrified bond. For extremely hard materials, particularly for sintered carbides, diamond sticks may also be used. Grit sizes generally run from 36 to 600, and bonds may be soft, medium or hard.

Grit size determines the degree of roughness on the finished surface, but there are no hard and fast rules as to what stone should be used for any particular job. Amount of stock to be removed; hardness and roughness of the original holes; and type of hole, whether plain or interrupted, all have their influence. The sticks may be supplied in straight sections to be attached to their holders by the user, or they may be furnished complete with holders. For attachment, the popular "model airplane" cement may be used, although flake shellac is often preferred. To use this, the holder is warmed over a hot plate until the shellac melts and the old stone may be pushed out. A few flakes of shellac are then sprinkled in the holder, heated to the melting point, and the new stone inserted.

Some manufacturers, however, discourage the mounting of stones in the field, on the grounds that it can be done more effectively and at lower cost at the factory. Mounted stones purchased from the hone manufacturer are usually regraded into much smaller hardness ranges than when purchased from a stone manufacturer. This insures the customer's obtaining the same results from one lot of stones to another of the same hardness.

Quality of the surface obtained depends chiefly on the size of the abrasive, but the normal surface produced by a given grit can usually be made finer by changing the ratio of reciprocation to rotation so more multi-direction action is obtained. In general, however, it is better to use a finer abrasive to to get a finer finish. Hardness of the bond is also an important factor, and the harder the material, the softer should be the bond.



Clean coolant is essential to successful honing. For ferrous metals the magnetic separator is recommended because of its effective and trouble-free operation. Filters must be used on non-ferrous materials

Choice of Abrasives

Selection of the abrasive depends chiefly on the material being finished. For cast iron, silicon carbide is generally used; for steel, aluminum oxide is preferred. Diamond sticks are costly but produce excellent results on the hardest materials, such as sintered carbides.

Final selection, however, is largely a matter of compromise. For a given job, a stone is selected on the basis of past experience and usually on the advice of the hone manufacturer. A trial is made with this, and then a grade or two harder or softer and variations in speeds may be tried until the various factors balance out to give optimum results.

Coolants Are Important

All machine honing is done with the aid of a coolant, and satisfactory results can usually be obtained with a sulfurized mineral base or lard oil mixed with kerosene. For cast iron, straight kerosene or mineral-seal oil is often recommended, and for steel tubing a mixture of lard oil, kerosene and sulfur base. For hard steel a light machine oil may replace the lard oil in the above mixture. For glass and similar brittle materials turpentine is advisable, and for bronze and other soft metals straight lard oil is preferred, although some bronzes require a sulfur-base oil to prevent loading of the stone. Water-soluble coolants have not proved satisfactory for any honing applications.

The recommendations of the hone manufactuer should be followed in selecting the coolant. He can furnish his own product, or can recommend one properly compounded for honing by the major oil companies. The right oil is important as regards both production and finish, and it must be supplied in liberal quantities; 40 gpm is not unusual. Of equal, or even greater, importance is cleanliness, and every care must be taken to prevent chips and particles of abrasive from recirculating to the work surface. Any of the industrial filters will be satisfactory, provided they are cleaned regularly, but magnetic separators are generally preferred when honing ferrous material. These will operate continuously without attention, and as they cannot become clogged they will never bypass dirty coolant back into the system.

With portable hones it is not always practicable to supply a flood of coolant, but requirements are not usually so exacting as in machine honing. When a lubricant is necessary to obtain a fine finish, ordinary vegetable shortening will often be satisfactory.

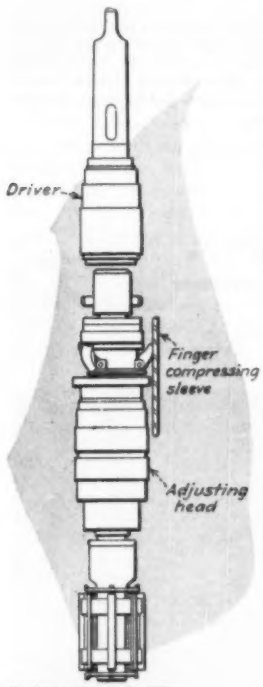
HONING HEADS •

FUNCTION of the honing head is to drive, hold, and control expansion of the abrasive sticks, and to provide means whereby they may be expanded as they wear down and as the hole becomes larger, thus developing a definite size. Expansion may be mechanical or hydraulic, and is usually performed by one or more conical members bearing on the back of the stone carriers.

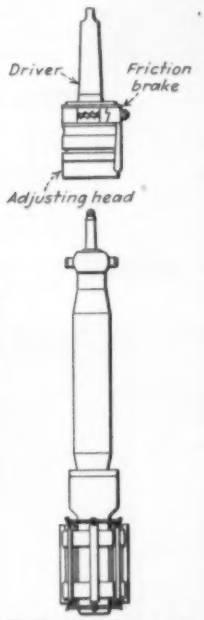
In the Micromatic hones, three methods of applying pressure to the cone are available. In one, three fingers are forced into a bushing as the tool enters the work. This compresses a caged spring which bears on the cone, and snaps the stones outward against the work. The peculiar advantage of this is that the impact breaks the glaze left by the previous piece and insures fast cutting. As the stones wear and the hole becomes larger, the pressure is dissipated, the stones become dull, and a finer finish is produced. A micrometer adjusting sleeve permits compensation for stone wear, but the disadvantage is that pressure is not constant, and variations in original hole size will produce different original pressures. In some cases, particularly when the hole is much undersize, the high starting pressure may be sufficient to distort the bore.

In the brake type, the cone rod turns into the drive shaft and is equipped with a hand-operated friction brake. Application of the brake through planetary gearing, causes relative movement between the cone rod and the drive shaft, and advances the cone to expand the stones. This is perhaps the most widely used type of hone, and may be used in standard drillpresses. Stone pressure, rate of stock removal and degree of finish are controlled entirely by the operator.

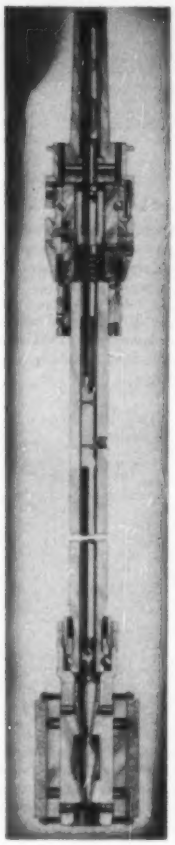
The hydraulic type is expanded by a hydraulically operated rack in the head of the machine pushing on a thrust rod in the driver, and must be used in a properly de-



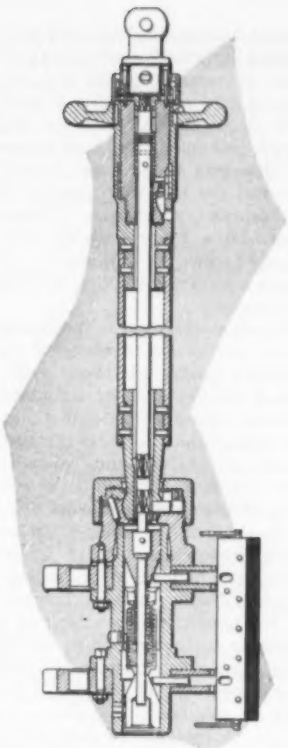
Spring-actuated Micromatic hone suitable for general-purpose use in drillpress or portable tool. Spring release drives stones against side of work and breaks any glaze produced by previous piece



Brake-type hone produced by Micromatic Hone Corp. Expansion of the stones is by a friction brake and may be controlled manually by the operator or by special equipment for automatic sizing



Micromatic Hydrobrake tool can be used in any honing machine. The stones can be expanded by a handwheel or friction brake, or by hydraulic pressure in a machine equipped with a hydraulic system



Alexander-Ball mechanically operated hone uses two cones working in opposite directions to produce expansion of the stone holders. Control is by friction brake or handwheel and micrometer stop

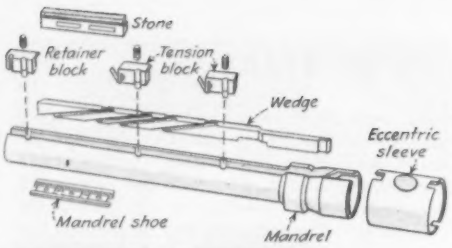
signed machine having a hydraulic system to furnish power for expansion. Pressure is applied at a controlled rate so expansion is positive and uniform. Because feed rate is controlled there is no danger of distortion of the bore. A variation of the hydraulic type is the Hydrobrake, which is a combination of the brake and hydraulic types. In this, the tool may be expanded either hydraulically or by the brake.

Another variation is the Micromold tool in which many of the working parts have been eliminated for the sake of simplicity. The stones are molded into a plastic holder which replaces the usual shell, stoneholder and expander. The plastic is flush with the surface of the stone and wears down with it, giving a broader contact area, improving stability in the bore, and helping to bridge keyways and other cavities. The back of the plastic holder is tapered to conform to the expanding wedge, and the tool is expanded to rough bore size by direct thrust of a piston in the head. Expansion for sizing is by an adjusting sleeve on the spindle which may be operated manually or mechanically.

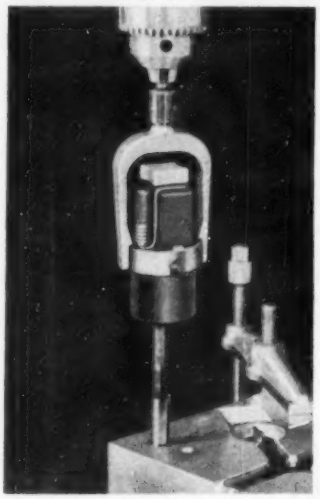
Alexander-Ball hones are mechanically operated and employ two cones moving in opposite directions. These bear against pins on the upper and lower ends of the stone carriers. Some models are made with removable flanges to permit use of the same body and stone holders for honing a wide range of bore sizes. Expansion adjustment may be by a knurled sleeve, with or without a brake, or by a handwheel. The latter is preferred when the tool is used in a horizontal position. Also provided is a micrometer stop that limits expansion to prevent honing oversize.

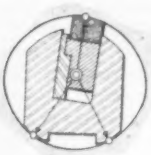
Stone holders on the Alexander-Ball tools are so arranged that the stones are slightly ahead of center, rather than radial. Cutting pressure is thus concentrated on the leading edge, preventing any tendency toward chipping of the trailing edges when a new set is put into service.

Sunnen hones differ sharply from the other types, and are available



Sunnen hone, mandrel type, makes use of a sliding wedge, mechanically operated, to expand or contract the stone. Several stones may be placed in tandem for long work

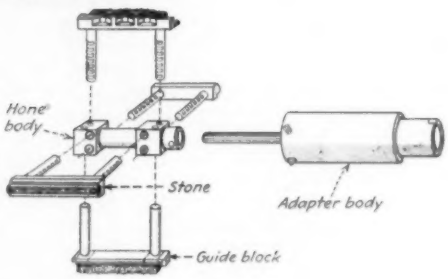


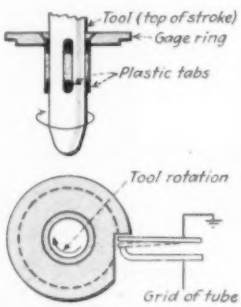


Sectional view of Sunnen hone showing the unequally spaced three-point contact. Self-centering design provides stability and generates a true, round and straight hole with minimum of stock removal

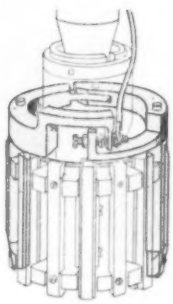
Honall tool produced by Sunnen can be used in toolroom drillpress for fine finishing, or can be held in portable tool on the assembly floor to avoid carrying large, heavy work to the machine

Rack and pinion system provides extremely simple stone expansion for Sunnen two-stone honing heads in sizes over 2⅝ in. Unit may be used in portable tool or in standard Sunnen machine





Gage-ring type of automatic size control for Micromatic hones. Plastic tabs on stones contact ring when part is to size, rotate it, and close electrical contact to halt operation



Gage-bar control for Micromatic hones has two bars floating on tool body and contacting work under spring pressure. When size is reached, contacts initiate stop signal

in two styles. For smaller sizes—up to about 2⅝ in.—the mandrel type is used. This employs a single stone or row of stones, and two guide shoes. Shoes are integral with the mandrel in the smaller sizes, but replaceable on the larger sizes. Expansion is by a wedge, or series of wedges, controlled by a dial on the machine. The unequally spaced three points of contact provide stability and generate a perfectly round hole. Mandrels are usually held rigidly in the machine in a horizontal position, and the work held by hand and stroked back and forth.

The mandrel principle is also adopted to a special honing unit known as Honall. This consists of a mandrel adapter with feed screw and driving yoke. It may be used in a drillpress or with a portable drill. Range covered is from 3/16 to 1 in., and it is possible to obtain finishes as fine as 2 mu in., and accuracies within 0.0001 in.

For larger holes—over 2⅝ in. —a honing head is employed. This consists of a hone body with four carriers, and an adapter body. Two of the carriers hold the abrasive stones, and two serve as guides. Pins on the carriers have rack teeth cut on one side to engage a long pinion on the adapter. Rotation of the pinion produces the desired expansion of the stones. This unit can be employed on a honing machine or as a portable tool driven by an air or electric drill.

Special Heads

A variety of special heads are made by the different manufacturers to suit varying conditions. These include bottoming types for operating in blind holes, tandem heads for align honing, and specially designed models for splined and similar holes.

For repetitive work, automatic size control is available with Micromatic hones. In one system the stones are molded into plastic holders which extend beyond the stone at each end to form gaging tabs. The plastic wears down at the same rate as the abrasive, so the diameter of the tabs always equals the diameter of the work A gage ring is mounted above the work and is free to align itself with it. It is, however, prevented from rotating by a leaf spring. A carbide insert in the ring is made to the low limit of the desired bore size. At each stroke of the hone the tabs enter the ring, and when size is reached the pressure of the tabs is sufficient to start rotation of the ring, flex the leaf spring and make contact with a stop pin. This contact grounds a low-potential circuit and initiates the to-size signal.

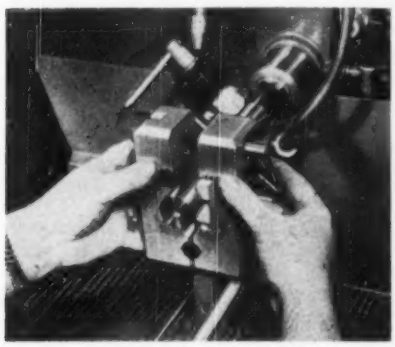
A second type, used on the larger sizes, employs two floating bars on the body of the honing tool. These are held against the bore by light spring pressure. At their upper ends the bars are attached to a split, hinged ring carrying adjustable contact points. As the bore is increased in diameter the ring opens up and the overhung contacts move closer together. The points are adjusted so they meet when the bore is to size and initiate the to-size signal.

In both systems, the to-size signal is picked up by an electronic tube which starts the electrical sequence to stop expansion of the tool, time a runout period, collapse the tool and withdraw it from the bore.

With gage-ring control, size tolerance is held automatically to less than 0.0003 in. With bar control a tolerance of less than 0.0007 in. can be held on most applications.

Special Attachments

Although the fine cross-hatch pattern produced by honing is the most desirable type of surface for most work, there are occasions when a straight-line finish is required. This can be achieved by a special arrangement whereby continuous rotation of the head is stopped, and automatic intermittent indexing is employed for partial rotation of the head each time it returns to the entrance of the bore. The abrasive sticks are somewhat wider than those normally used, and the indexing is unevenly spaced so the stones will not retrace in the same track or over the same straight line. The process produces the predominant smooth-



Sunnen external hone uses the double-stone and single-shoe principle and is stroked by hand. It will remove the clover-leaf pattern sometimes produced by centerless grinding, and will hold size within 0.0001 in. Torque arm bears against a bar to absorb force of cutting action

Micromatic external hone may be hydraulically or mechanically contracted. Like internal hone, it will develop any desired finish, including straight-line, geometrical accuracy and exact size

Manually operated Micromatic Odee external hone will hold tolerances of 0.0001 in. or less, regardless of length of work. Abrading forces are self-reactive, so do not tend to bend the work

ness in the direction of wear, or parallel to the axis, and is more commonly employed in external honing. For example, shafts which reciprocate through packing will cause much less wear on the packing if straight honed.

The geometrical accuracy (within 0.00003 in.) and the finish obtained by honing make lapping unnecessary in most cases. However, where this is required, it is quite feasible to substitute cast-iron sticks or rawhide strips for the stones, and apply rouge or similar loose abrasives as desired.

External Honing

As with the internal process, external honing offers the particular advantage of rapid stock removal without objectionble heat, and produces geometrically round and straight surfaces. Usually, the work is rotated and the stones stroked back and forth for the full length. It is, however, possible to reciprocate the rotating work through the head if circumstances require.

In the Sunnen external hone a double stone and a guide shoe are held in a yoke which is contracted on the work by a feed screw and micrometer adjustment. By setting the micrometer so the control lever is against a stop when the part is to size, any number of parts can be brought to the same diameter without danger of cutting undersize.

The work is held in a chuck and the honing tool slipped over the end and stroked by hand. A torque arm on the tool rests against a guide rod to absorb the force of the cutting action. Standard length stones are supplied for ordinary work, but if there is an appreciable amount of bow to be corrected, tandem or double-length stones and shoes should be employed to increase the effective length of contact and prevent following the work curvature. In such cases the contact surfaces should be at least two-thirds the length of the work surface.

In the Micromatic external hone the stones are arranged around the inside of a holder and are contracted either mechanically or hydraulically by an internal ring cone. The work is chucked or held between centers, and is rotated while the head reciprocates. Micrometer adjustment, either manual or automatic, permits obtaining the same degree of accuracy as in internal honing. For straight line honing, the work is indexed automatically at the end of each stroke, instead of rotated.

A new Micromatic, manually operated external hone, known as the Odee hone, is now available. It uses two stones and one guide shoe, and can be applied to work from ½ in. to 2½ in. in dia. Accurate chucking of the work is not necessary, because the tool is self centering, and work can be held in a lathe, drillpress or portable drill. To set the tool, the stone holders are adjusted to a scale graduation on the support arms, and the feed knob turned until the work will enter the tool endwise. Adjustments for stone wear are made by turning the feed knob. Torque is absorbed by holding the tool in the left hand while the right hand strokes it over the work and adjusts the infeed.

Flat Honing

Finishing of flat surfaces to accuracies of millionths of an inch was formerly considered an expensive process to be achieved only by lapping. Recent developments in honing machines, however, have now made it possible to develop optically flat surfaces with absolute parallelism and uniform surface finish. Materials so finished may vary from soft, nonferrous metals to hard steel or ceramics, and abrasives may be loose or bonded.

HONING MACHINES •

Sunnen precision honing machine finishes bore of 183 case hardened gears per hr. with a blind operator. Work is stroked over stone by hand. Tolerance on these parts is 0.001 in., but 0.0001 in. can be held without difficulty

MECHANICALLY expanded hones can be employed in any machine having a rotating spindle, and in which either the spindle or the work can be reciprocated. However, drillpresses, lathes or other machines used in this way should be regarded as merely makeshift, and will not give the same results as can be obtained from a properly designed honing machine.

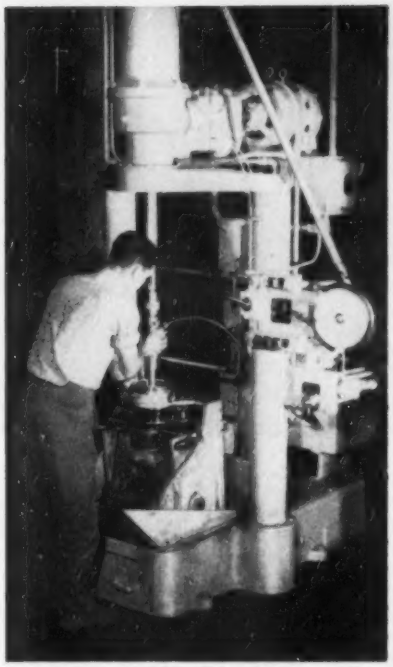
Such machines may be vertical or horizontal. The vertical type is preferred for the usual run of work, as it occupies a minimum of floor space and work loading is generally simpler. The horizontal type is required for long work and for external honing, and is preferred for hand-held work and for small, magazine-fed work. Some long work has been done in vertical

machines mounted over a pit, but handling and fixturing become difficult.

Single-spindle, vertical machines are the most widely used, but multiple-spindle models are available for special applications. In the automotive field, for example, eight-spindle machines are used for finishing cylinder blocks, and two- and four-spindle types are frequently employed where rapid production is needed.

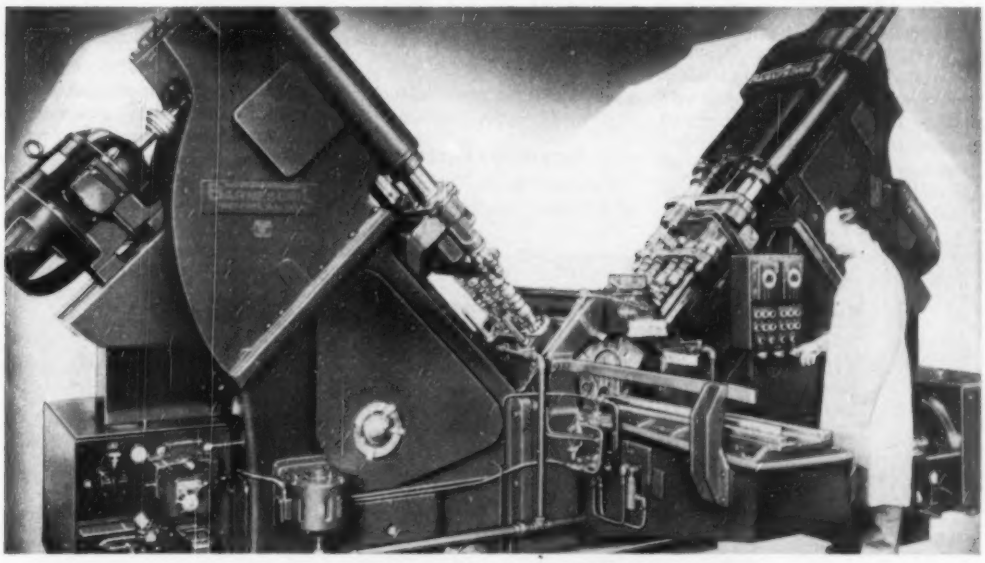
Most machines made by Barnes Drill Co., C. Allen Fulmer Co., and Micromatic Hone Corp. are designed with motor drives for spindle rotation and hydraulic mechanism for reciprocation. Those made by Sunnen Products Co. have electric spindle drive, but no provision for reciprocation, as they are manual in operation. However, both Barnes and Micromatic have a model employing mechanical reciprocation.

Sunnen and Micromatic machines require their own tools, but those made by Barnes and Fulmer can use either Micromatic or Alexander-Ball tools interchangeably. They have, or can be equipped with, the mechanism and controls for operating hydraulic hones and

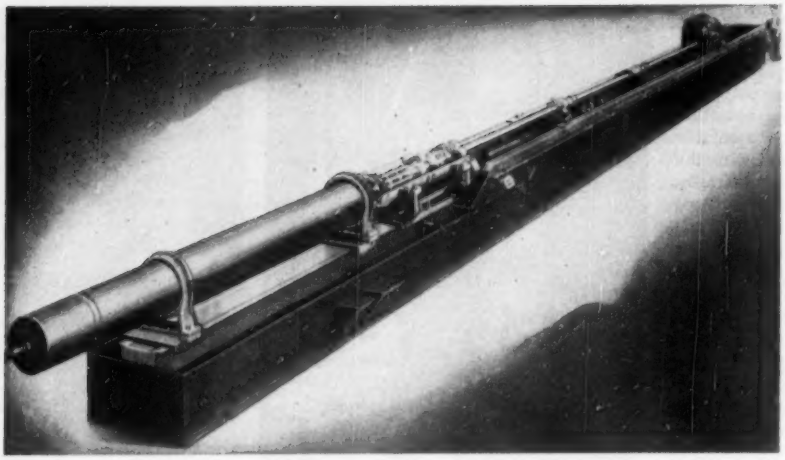


Single-spindle, general-purpose Fulmer vertical honing machine used for reconditioning aircraft cylinder barrels. Bore is 5¾ in., and 0.006 in. is removed from 24 pieces per hr.

Double-spindle Micromatic Hydrohoner equipped with magazine feed and electronic size control. Bore is held within 0.0003 in., finish is 10 mu in., production 300 gears per hr.



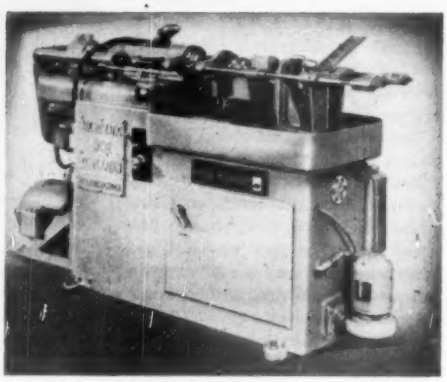
Duplex, 45° Barnesdril multiple-spindle machine for V-8 motor block. All spindles operate simultaneously, and on uniformly prepared blocks with 0.002-in. stock removal, production is 100 per hr.



Horizontal, hydraulically reciprocated Barnesdril machine with 54-ft. spindle stroke for 16-in. ID tubing. Machines of this type are made with strokes from 6 ft. to 76 ft. with mechanical or hydraulic hones

automatic sizing equipment. Work tables can be fixed, rotary or sliding, with vertical, side-to-side, or forward-and-back movement.

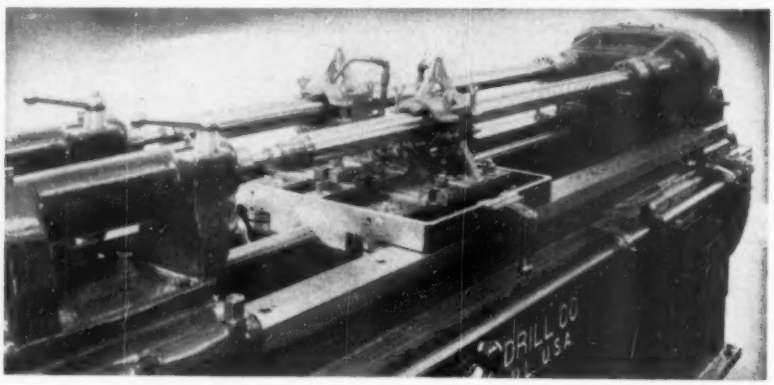
Hydraulic reciprocation provides the advantages of infinitely variable speed, with a cushioning action at the end of each stroke. Controls may be so arranged as to allow a dwell at the bottom of each stroke to avoid taper in blind holes, and the stroke control handle may be operated manually to permit short stroking at any point in the bore to remove taper or to make any desired correction in the cylinder. For production work, an electrically controlled stroke timer is available. This provides automatic quick approach into the work, automatic assumption of the strokes, predetermines the number of cycles of operation by the element of lapsed time, and then automatically contracts and lifts out the tool and stops in the upper position.



Magazine-fed, fully automatic, horizontal Micromatic Hydrohoner removes 0.002 to 0.003 in. from cast-iron valve guides at 250 per hr. Size is held to less than 0.0003 in., and taper and out-of-round to less than 0.0001 in.

Fixtures are Important

The rapid stock removal and the high torque developed by modern honing equipment necessitate considerable care in the design of fixtures. These may be fixed or full-floating, depending on the type of honing head used. For light work, a floating fixture may be used with



External, horizontal, double-spindle Barnesdril honer may be used for either rotary or straight-line honing. Depending on the model, either the honing head or the work may reciprocate

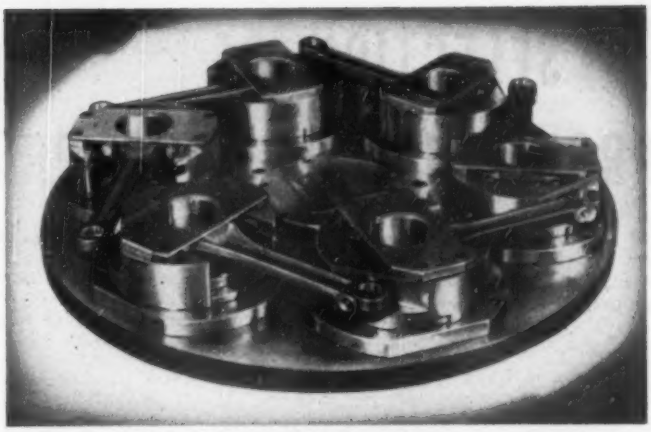
a rigid hone spindle, but this introduces some complications in design, as the work must be held firmly to prevent rotation, but must still be free to float so the axis of the hole can align itself with the hone. However, the difficulty of making a true universal joint, particularly in the smaller sizes, usually makes it preferable to employ this type of fixture. The actual work holder must have a lateral floating movement and a universal swiveling movement about the geometric center of the hole in the work.

For heavy work, and in multiple-tool honing, rigid fixtures and floating tools are essential, and are frequently preferred, even on lighter work because they permit of much simpler fixture design. With such fixtures it is necessary to furnish a guide bushing to lead the tool into the bore, and provision must be made for loading and unloading without disturbing the tool.

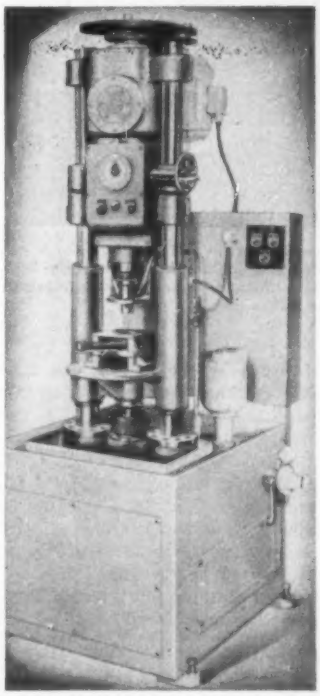
For relatively short work, the parts may be stacked to increase production by taking advantage of the maximum length of stroke of the machine. Thin-walled sections must be so held as to avoid distortion. The best means of achieving this is to clamp on the end with a washer-type clamp.

Shuttle fixtures can materially increase production by permitting one part to be loaded while a second is being finished. Still greater efficiency can be obtained by use of indexing fixtures. These are particularly useful with dual-spindle machines for progressive honing, where one spindle roughs out the greater part of the stock, and a second spindle precision finishes the bore to exact size and surface quality.

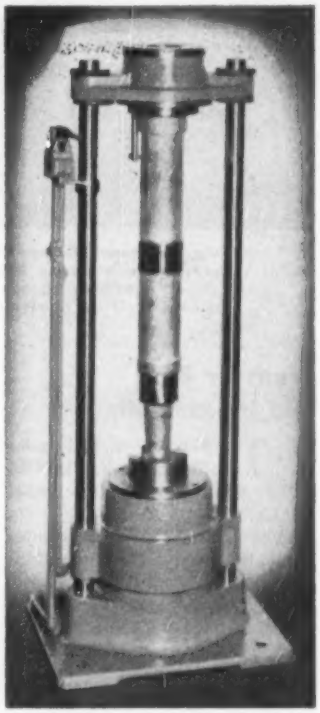
Since a fundamental part of the honing process is the over-run of the stones beyond the end of the bore—except in blind holes—provision must be made in the fixture for passing the end of the hone through, as well as for allowing free passage of the coolant. Ease of loading and unloading is also important because the rapidity of the honing process is such that, unless proper precautions have been taken, handling time may well exceed operation time.



Rotary indexing fixture for six automotive connecting rods on double-spindle automatic hydrohoner. Rods rest on laterally floating seats. Production on this fixture is 250 rods per hr.



Mechanical stroke Microhoner with manually controlled expansion is designed to give maximum rigidity and stability to the tool. When the part is finished, the fixture bracket drops away from the tool so another piece can be loaded



Universal, power-operated fixture for holding tubular work during internal honing. Designed by Fulmer, it permits endwise clamping under any pre-regulated pressure up to 6000 lb

SELECTION OF PRODUCTION MILLING PROCESSES...V

Part loading and unloading time is minimized, or does not affect cycle time, when milling is carried out by the transfer-base and indexing methods. And rotary miling is an excellent way to produce small parts at high output rates

By MARIO MARTELLOTTI, THE CINCINNATI MILLING MACHINE CO.

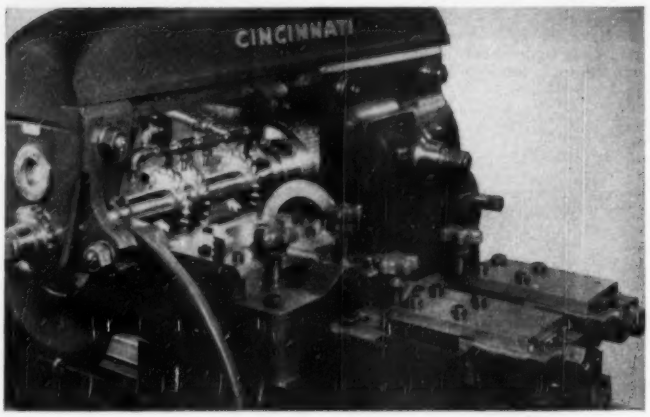


Fig. 1.. Corner on connecting-rod caps are rounded at rate of 50 pcs per 51-min. hr, using transfer-base milling in combination with abreast and string milling. Unloading and loading one set of fixtures is done while the other set is in the cut

Transfer Base and Index Milling

TRANSFER-BASE and index milling include all methods in which the work is either transferred from one position to the next or indexed into the next position in the cycle of operation of the machine. A number of different combinations are used in practice.

In transfer-base milling two fixtures are located at opposite ends of a two-station index base, which is clamped to one end of the machine table. While the work in one fixture is being milled, the other fixture is unloaded and reloaded, (always at one end of the machine). This saves the loading and unloading time, as in reciprocal milling, but adds the time required to index the base.

Transfer milling is similar to reciprocal milling (p 104, August, 1950) if the transfer base can be indexed while rapid returning it to the starting position. If extra time is required for indexing, then the cycle time per piece is:

$$t_c = t_m + t_i + T_s + T_s$$

where:

t_c = cycle time per piece, min.
t_m = time to mill one piece, min.
t_i = idle cycle time per piece, min.
T_s = indexing time, min.
T_s = time to start cycle of operation, min.

If $T_s = O$, the above formula is the same as for reciprocal milling.

In transfer-base milling, however, the setup can be made so that the work is close to the cutter, thus permitting a reduction in the time required to rapid advance the work to the feeding position. In addition, fixtures are identical, and a saving would result in cost of equipment.

In application shown in Fig. 1, transfer-base milling is used in conjunction with abreast and string milling. A two-station transfer base is placed on the right end of the table. Two hand-operated fixtures are located on opposite ends of the transfer base. Both fixtures have two stations abreast, each holding two pieces as in string milling.

The cycle of operation is: Start, rapid advance table, feed table to mill, unload and reload idle fixture, rapid return, stop, index or transfer other fixtures into working position. This cycle is subsequently repeated for the other station.

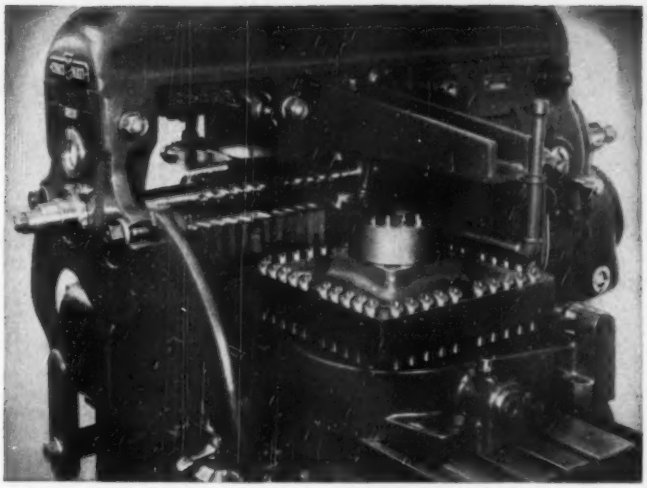
The time required to load and unload one set of fixtures is not counted because the operator may perform this work while the parts in the other set are being milled.

Cycle time per piece when there is only one piece in each station may be calculated by means of the previous formula, but if n_s pieces are located abreast in each station the time per piece becomes:

$$t_c = \frac{t_m + t_i + T_s + T_s}{n_s}$$

If string milling of the type shown in view *A*, Fig. 1 p92, Aug. 7, 1950, is added to this combina-

Abstracted from "A Treatise on Milling and Milling Machines" that will be published at an early date.



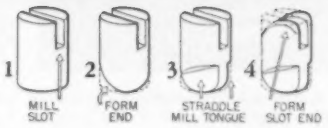


Fig. 2.. Approximately 1214 pcs per 51-min. hr. are milled with an automatic transfer base having four fixture stations. Parts are unclamped and ejected automatically after indexing occurs

tion, and n_s is the number of pieces in each row, the time per piece will be:

$$t_e = \frac{t_m + t_i + T_s + T_e}{n_s\ n_s}$$

Times T_s and T_e are the same as in the formula for simple transfer base milling, but times t_m and t_i are now the milling and idle cycle time, respectively, for the n_s pieces in each row. Their values are obtained as follows: If A and O are approach and overtravel, respectively, for n_s pieces, L_s is the length of cut per piece and L_A the table travel from the starting position to the point where the feed begins, then the travel per half cycle at feed rate F is:

$$A + O + n_s L_s$$

and the travel per half cycle at the rapid-traverse rate R is:

$$A + O + n_s L_s + 2 L_A$$

The respective milling and idle cycle times to use in the formula for string milling added to transfer-base milling are:

$$t_m = \frac{A + O + n_s L_s}{F}$$

and:

$$t_i = \frac{A + O + n_s L_s + 2 L_A}{R}$$

In the case shown in Fig. 1, where there are two stations abreast on each end of the transfer base, with each station having two pieces in a row, and $n_s = 2$, the formula changes thus:

$$t_e = \frac{t_m + t_i + T_s + T_e}{4}$$

A considerable increase in production rate can be obtained by automatically unloading the fixture and indexing the transfer base. This method is particularly desirable when handling a large number of small parts in each machine cycle, as in Fig. 2.

Each of the four stations on the transfer base is successively placed in front of the cutters by automatic indexing 90° in a clockwise direction. Parts are unclamped as the station is indexed to the inner or unloading position, parallel to the direction of feed, and are ejected automatically. The operator begins to load one station as soon as it is indexed into the unload position at the right-hand side. He may complete the loading when this station has been indexed to the front of the machine. Then he starts the cycle.

Four different milling operations

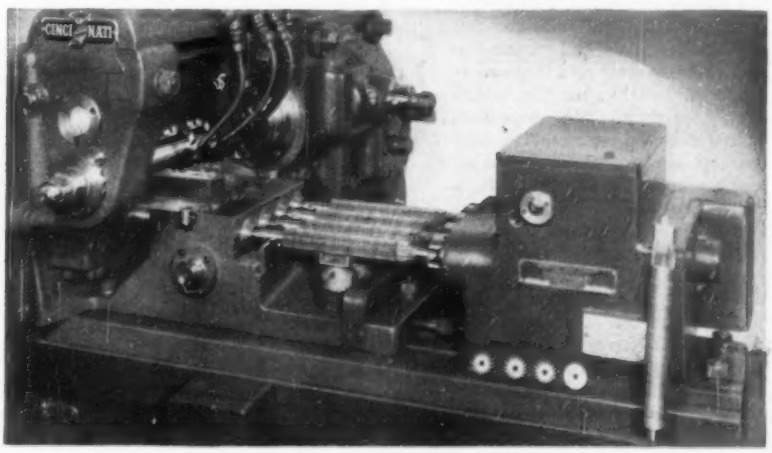


Fig. 3.. Four mandrels stacked with wheel-dresser blanks are placed between centers of the air-operated plungers of the four-station indexing fixture. The mandrels are indexed 17 times automatically to mill 18 teeth in the workpieces

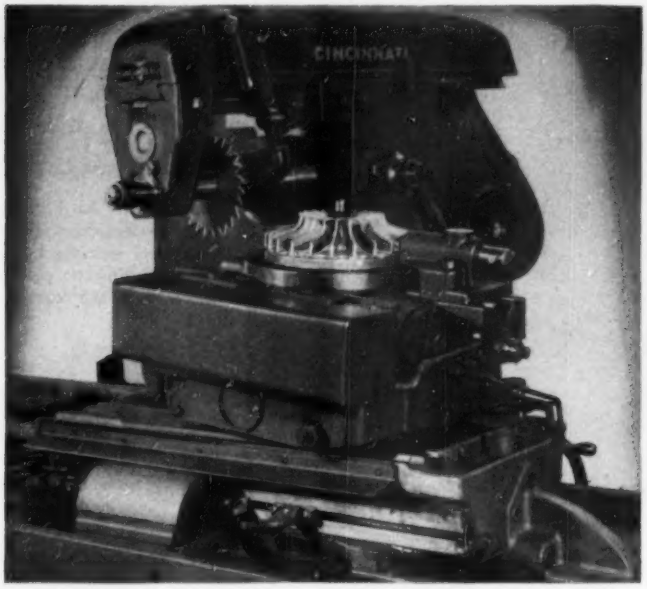


Fig. 4.. Hand indexing of an automatically oscillated fixture is practical for such work as sweep milling the spaces between impeller vanes

are performed with this equipment, using a separate gang of cutters for each of the four operations.

Index Milling

INDEX MILLING is the method used when identical multiple operations are performed on one or more pieces, Fig. 3. Here indexing has been combined with abreast and string milling.

A four-station automatic indexing fixture is used in conjunction with an automatic rise-and-fall manufacturing milling machine to mill eighteen teeth on a large number of dresser blanks. The blanks are stacked on four mandrels placed between centers. The only manual operation required is to insert loaded mandrels in the fixture or remove them, and start the cycle.

The eighteen teeth are milled in sequence by automatic-indexing the blanks seventeen times to complete the operation. Indexing is interlocked with the cam cycle selector, located in the base of the machine. The selector determines the successive positions of the machine spindle, the length of table advance, feed rate, return, and indexing for milling the eighteen teeth in the dresser blanks.

The cycle of operation is:

Start, table rapid-advances to the feed position, spindle carrier lowers to position for the depth of cut, table feeds at 7½ ipm for the length of cut, spindle carrier rises, table rapid-returns, work is indexed to the next position, table rapid-advances to the feed position, spindle carrier lowers to position for the depth of cut, table feeds at 7½ ipm. This cycle is repeated until all 18 teeth have been milled. The table is then automatically returned to the starting position, where it stops for unloading and reloading of the fixture.

The cycle time per piece is:

$$t_c = \frac{n_T\ (t_m + t_i) + t_h'}{n_s\ \ n_a}$$

where:

t_c = cycle time per dresser, min
n_T = number of teeth to be milled in each dresser
t_m = time to mill lone tooth on n_s dressers on a mandrel, min
t_i = idle cycle time when milling one tooth on n_s dressers on a mandrel, min
$t_h' = T_a + T_s + T_s$ = handling time once every n_T teeth milled, min; which includes the time T_a to start the cycle, the time T_s to pick up the mandrels and place them in the fixture, and the time T_s to remove the mandrels
n_s = number of mandrels abreast
n_a = number of dressers stacked on a mandrel

In the present example, $n_s = 4$, $n_a = 75$, and $n_T = 18$; consequently:

$$t_c = \frac{17\ (t_m + t_i + t_h')}{4 \times 75}$$

At the feed rate of 7½ ipm., the production rate is 1,300 pcs per 51-min hour.

Indexing Combined with Sweep Milling

THIS COMBINATION of operations is suitable for such jobs as milling of triangular spaces between vanes of impellers, Fig. 4.

The impeller is held on and located in a special hand indexed, automatic oscillating fixture.

The work is rapid-advanced towards the cutter, which begins the cut at the outer end of the vane and proceeds toward the center while the impeller is oscillated on its axis. This oscillation permits the cutter to remove excess stock from the triangular-shaped surface between the vanes.

When one space has been milled, the work is retracted rapidly, indexed, and rapidly returned to the cutting position, where the cutter begins to mill the next space. The operation proceeds in this manner until all the spaces have been

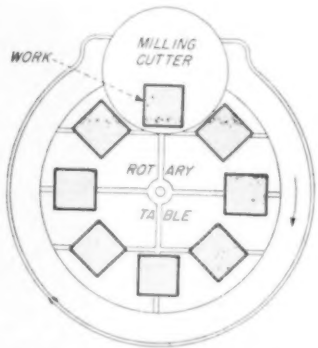


Fig. 5.. Rotary tables may be operated continuously at the feed rate or rapid traversed to bridge the spacing of parts and resume the feed rate

Fig. 6..Operating time consists only of the milling time when milling a groove in piston-ring segments. Each segment is held by a cam-type clamp. Cam arranged around the rotary table cause the spindle carrier to rise and fall in order to clear the cutter over the wings for the parts

milled. A new piece is then placed in the fixture, and the cycle of operation is resumed.

Rotary Milling

IN THIS method of milling, the parts to be milled are held on a rotary table which either involves continuously at the feed rate, or may be set through a cycle of alternate rapid rotation and feed to bridge the spacing between parts. The principle of operation is graphically shown in Fig. 5.

Rotary milling is frequently used when a number of parts can be milled by arranging them on a rotary table. As in reciprocal milling, loading and unloading of the fixtures can be done while milling. In addition, the idle cycle time can be reduced to a minimum so that, in effect, the operating time consists only of actual milling time.

In the application shown in Fig. 6, rotary milling is used to mill a circular groove on piston-ring segments. The fixture, clamped on the table of a standard circular milling attachment, holds six ring segments. The circular table is driven continuously at the feed rate by the feed drive of a rise-and-fall manufacturing milling machine.

Around the table of the circular milling attachment are clamped six cams, which successively engage the roller on the spindle carrier directly beneath the cutter. As the roller engages the cams, the spindle carrier rises and falls, in accordance with the profile of the cams, to carry the cutter over the clamping wings. Each segment is individually clamped with a cam-type clamp.

The operator loads and unloads the fixtures at the front of the machine, while milling proceeds.

Time per piece in rotary milling can be expressed:

$$t_c = \frac{P}{n_f\ n_c} + \frac{1 - P}{n_R\ n_c}$$

where:

t_c = cycle time per piece, min
P = fraction of a turn of the circular table made at the required feed rate
n_f = rpm of the circular table corresponding to the feeding rate
n_c = number of pieces arranged around the table
n_R = rpm of the circular table when rapid-traversing

The milling time t_m and idle cycle time t_i are, respectively:

$$t_m = \frac{P}{n_f\ n_c} \text{ and } t_i = \frac{1 - P}{n_R\ n_c}$$

In the case of the job illustrated in Fig. 6, $P = 1$; that is, the circular table is always rotated at the feed rate. Hence:

$$t_c = \frac{1}{n_f\ n_c}$$

This installment concludes the series.

Tips FOR TOP SHOP MEN

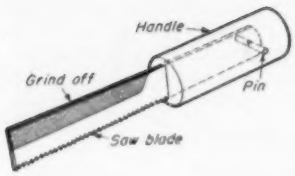
352 Slavery was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

353 Procedure for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

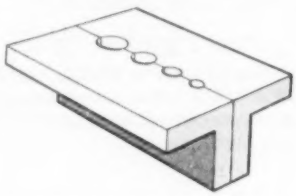
"and to think I said I'd never hire a Texan!"

DIEMAKERS' KINKS

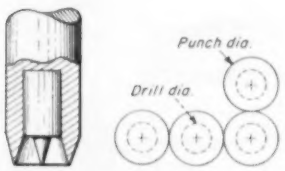
BY FEDERICO STRASSER



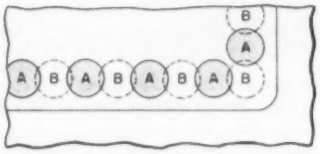
SMALL SAWS are a great convenience when removing the central slug of a blanking-die opening that has been drilled for lack of modern equipment. Usually the holes drilled inside the blanking layout are too small to admit a hacksaw blade. So grind away the back of the blade and pin it to a wooden handle.



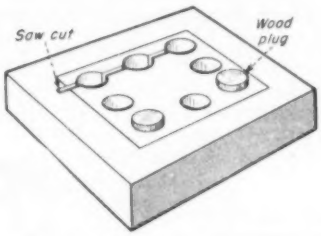
TO PEEN the heads of small punches, make a pair of vise jaws with slightly undersize holes drilled in the plane of the mating faces. This device is useful also for heading rivets.



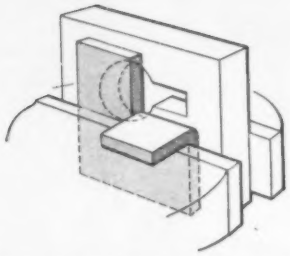
A SPECIAL MARKING PUNCH for die layout consits of a hardened tool-steel body machined out to receive a prick-punch center and with the lower end ground like a dinking die. By lightly striking this punch, a center mark and a concentric circle will be produced. The edge of the "dinking die" can be set to the blanking line. Now, if the drill to be used is somewhat smaller, there will be no chance of drilling into the cutting edge.



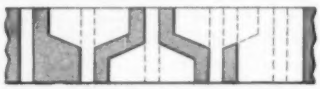
SAWING out of the central slug in a die opening can be avoided by drilling holes that overlap. After drilling every other hole, *A*, the diemaker plugs them with steel dowels of the same material and hardness as the die plate, so that the drill will not walk when drilling holes *B*. After this, the central slug is easily tapped out.



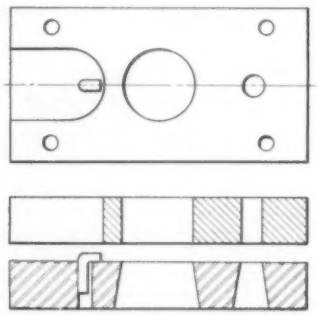
WOOD PLUGS driven into the corner holes will often prevent ruining a blanking die. The diemaker has drilled holes around the blanking layout and is ready to saw out the central slug. Sometimes he inadvertently makes a saw cut into the corner of the die. But by driving in the wood plugs in advance of sawing, he is warned in time that the cut is finished.



SPECIAL VISE JAWS protect die-opening surfaces from being damaged if the file slips. One jaw has a vertical wing that can be positioned, as shown, to partially cover the round hole, while filing on the flat of the rectangular opening.



HOLES DRILLED from opposite sides of the die plate can be arranged to remove most of the central slug. First make a layout inside the blanking outline. Then at each hole center drill a small hole completely through the plate. Next, with a large drill that would ordinarily produce overlapping holes, drill alternate holes partway through the plate from opposite sides. Now that the drill has adequate support, drill the holes through.



VISIBLE STOP PINS are desirable in blanking and progressive dies. The production rate is increased and the tool is more conveniently used if an adequate hole or other opening is made in the stripper plate so that the stop pin is made visible.

ROUND TABLE

Squeal or Squirm?

"How about some help, Ed? I'm really in a spot."

"Sure, Al, but all I can manage this time is a ten," Ed replied, digging into his pocket for the bankroll.

"No, I really need some expert advice this time. I've got a problem that's really giving me a hard time."

"Okay, shoot!"

"It's about one of the men squealing on another. I don't like it, but I don't know how to handle it without getting one of them, or both, either steamed up or in trouble."

"Who are the culprits, and what's the beef?"

"Well, Moore complained to me that Riley is dogging on the job—really bad. Moore said he was deliberately stalling, Ed. It's sort of a mean trick to play on Riley, but I think Moore was mad because of the effect it would have on his work—and everyone else's, too. Riley can ruin our production rate if he really tries."

"That's serious, all right, Al. But what about Moore? If you do anything about his story, you're liable to encourage tattle-taling in the eyes of men—and that's bad."

"Yeah, that's bad; and so is letting Riley get away with his doggin'. That's why I wanted to ask your opinion. I know we disagree a lot, but this is one problem that really has to be worked out sensibly, somehow."

"Why didn't you cut Moore off when you realized that he was squealing on Riley? You might have told him that it wasn't any of his business."

"I started to, Ed, but then I thought that if Riley gets away with anything, the rest of the men are going to lose confidence in me, and some of them might try a stunt like that, too."

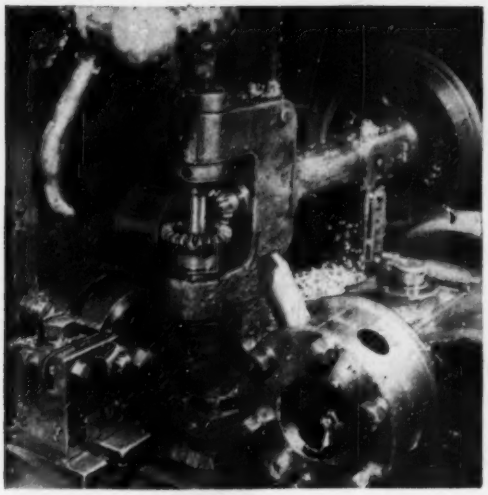
"How about calling together a committee of your best men to see if they can straighten it out? You don't have to mention Moore's name. Maybe you could let them assume that you saw what was going on and wanted to get it straight without taking any drastic action."

"That might work, Ed, but it would be releasing a lot of my authority. The situation might come up again, and then I'd have a tough time trying to get anybody to fly right."

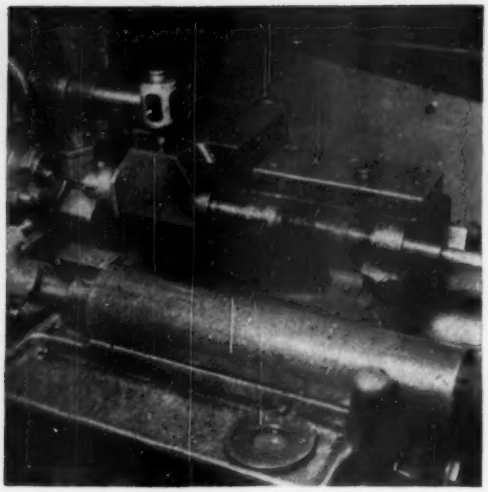
"Well, why not put it straight to Riley? You could warn him you know what he's doing."

"Yeah—and he'd know I was tipped off. No, thanks!"

HOW CAN AL get out of this one and still keep the majority of his men happy with his foremanship? Can he afford to shift the action to his best men, or should he go out and lay it on the line to Riley? Or how about just keeping quiet about the whole business? Discussions of earlier topics appear on later pages.



Cross-milling attachment mounted on rear cross-slide of No. 00 B&S screw machine mills 0.110-in. wide flat under head of 4-48 steel screw. Guard normally in place over bevel gearing was removed for picture



Eccentric drilling unit is mounted on special end slide on No. 00 machine. Eccentric turning also can be done with a hollow mill. Drill spindle can be offset through screw-actuated slide. Unit is cam-controlled in usual way

TRY THESE TRICKS ON YOUR SCREW

Greater flexibility, fewer second operations, and lower costs result from special attachments for cross-milling, eccentric-drilling, and rapid feeding

BY E. W. HEYDEN, Production Superintendent, MONROE CALCULATING MACHINE CO., ORANGE, N. J.

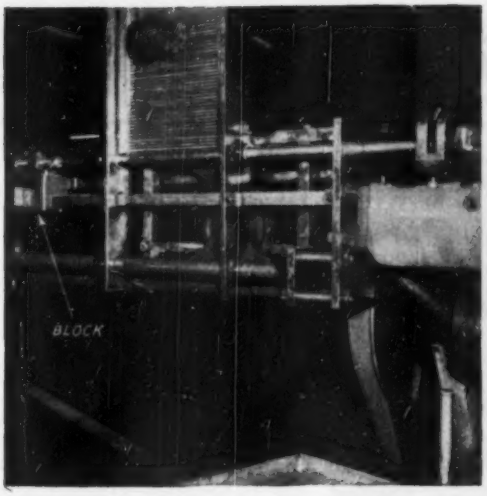
SPECIAL tooling has eliminated secondary operations on several screw-machine jobs at Monroe Calculating Machine Co. One attachment performs a variety of cross-milling operations on the machine, a second permits eccentric-drilling to any specification within the stock capacity of the machine. As the cost of a single operation performed off the machine often is 5 or 6 times more than that of all operations performed on the machine, these units, by eliminating second operations, are important factors in achieving low unit cost.

The cross-milling attachment operates on the rear cross slide of a No. 00 B&S and is driven from an auxiliary motor mounted on a bracket at the rear of the machine. Milling is performed at constant speed with a feed of 0.003 to 0.004 ipr. Cutters rotate against the machine spindle, and cutters of ⅞, 1, 1⅛, or 1¼ in. diameter can be installed. Single-cutter or straddle jobs can be done and the width of straddle cuts can be set as required.

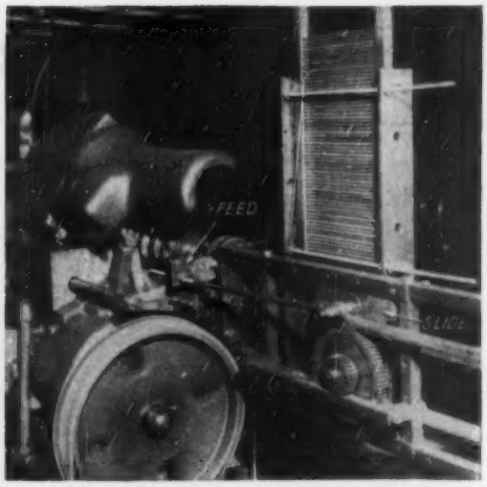
In the job shown, a revolving diehead is mounted in the turret and is driven by a separate pulley on the same motor that drives the milling attachment. The spindle rotates in the forward direction, and the diehead is run backward at lower speed than the spindle. When threading is completed, the spindle is stopped and the diehead automatically backs off. While the spindle is stopped, the milling attachment advances to straddle mill a flat under the screw head.

For eccentric drilling, the usual turret slide has been replaced by a special slide carrying a powered drill spindle. This is driven by a motor mounted at the end of the machine and equipped with a four-step pulley to provide different speeds for the drill spindle. In the spindle assembly is a woven wire section that takes up the shock as the drill contacts the bar. An offset to either side of the spindle centerline can be obtained, the amount of offset being sufficient to meet the eccentricity requirements of any bar within the capacity of the machine. As drill size, spindle speed, feed rate, and amount of offset are adjustable, considerable flexibility in eccentric drilling is possible.

There are some jobs, of course, on which second operations cannot be avoided. Where possible, we also run these operations on screw machines, using magazine feed. Several of the jobs that we are running this way are 6 to 8 in. long. Normally, these



Front—Special magazine feed multiplies normal machine feed four times. Six-inch piece is pushed from magazine into stock tube by motion of block at left. Machine feed stroke is 1.5 in.



Rear—Machine feed mechanism advances slide on which double gear is mounted. Large gear advances movable rack to which feed block (front view) is attached

MACHINES

parts would require several strokes of the standard machine feed mechanism to advance the piece the required length. To overcome this, we have devised a special magazine feeding arrangement that multiplies the stroke of the machine four times. A two-inch feed stroke of the machine actually advances the piece eight inches.

This unit obtains its multiplication through the 4 to 1 ratio of a double gear. The gear is mounted in a slide that is actuated through a rod attached to the machine feed mechanism. For purposes of explanation, assume a machine feed of 1.5 in.: as the slide advances 1.5 in. the small pinion moves the same distance along a fixed rack. In the same movement, the large gear advances a movable rack 6 in. Attached to this rack is a block and rod that pushes each piece from the magazine. One piece pushes the one ahead, and so on, through the feed tube to the tooling area. The entire feed range of the machine thus is increased four times, giving faster and more accurate feeding.

Numerous other setups, of course, are equipped with standard attachments designed by the manufacturer of the equipment. Those described here were designed and built in our plant to meet our own needs. Each offers the ease of change-over and flexibility required for producing economically a variety of relatively small-lot jobs. In operation for several years, they have proved entirely satisfactory.

Welded Milling Cutters Are 60% Cheaper

BY R. E. LINDSAY, Welding Engineer, THE LINCOLN ELECTRIC CO., CLEVELAND

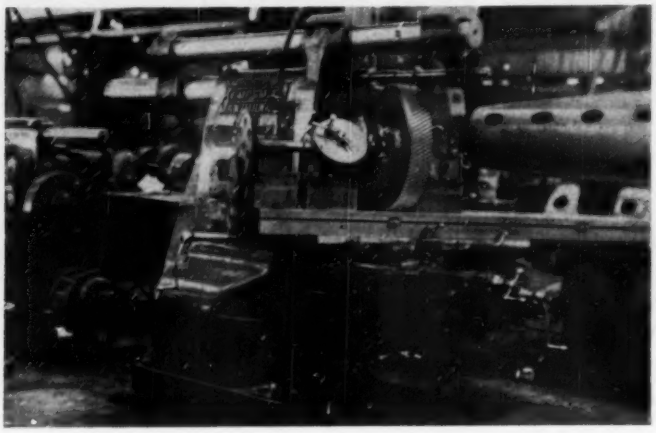
MILLING operations on well-drilling tools produced by Acme Fishing Tool Co., Parkersburg, W. Va., sometimes necessitate heavy cuts, and persistent breakage of milling and radius cutters became a serious cost problem. Most breakage occurred at the hub or near the center, in the keyway, although there were occasional tooth failures.

To overcome the difficulty, the company now makes its own cutters by machining the body from a blank of 3% nickel steel. A substantial hub is left at the center. The teeth are notched out and then built up with Toolweld 60, a tool steel electrode produced by Lincoln Electric Co.

Before welding the blank is preheated to 400 F, and 2 or 3 passes are usually sufficient to produce the build-up. A 5/32-in. electrode is used at approximately 130 amp. Final operation is to grind the teeth to required size and shape.

Cutters made by this method have been in operation for 4 yr and have shown remarkable ability to withstand heavy shock and deflection. Cost is generally 60% below that of conventional cutters, and an 11-in. cutter can be produced for a total of $25.

Practical Ideas

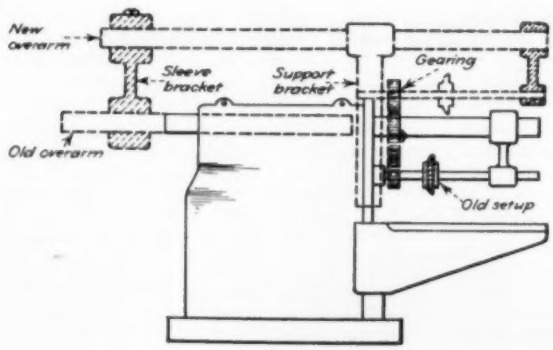


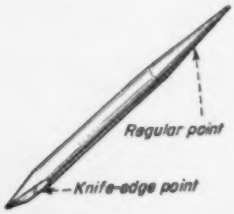
Miller Cuts Oversize Gears With New Overarm

AFTER CONVERTING one of our milling machines for larger work, we were able to cut helical gears up to 40 in. in diameter with the same machine on which we could normally only cut 12-in. gears. The new overarm also permits other large work to be milled with good precision.

This was done by building a new overarm and installing it on special bearings that were fitted to the head of the machine. The regular overarm was pushed back and attached by a sleeve bracket to the new overarm to give additional support. Two small gears and a larger idler gear transmitted torque to the spindle in the new position, which was much higher than previously. The arbor was supported between the regular bracket, which was mounted on the new overarm, and a bushing in the new overarm support. As can be seen in the photograph, the new rig easily handles a large gear. The new overarm mount is sketched below.

Helical gears are set up in a conventional method between centers with a dividing head. *Justo P. Ramirez A., Oficina Maria Elena, Chile.*

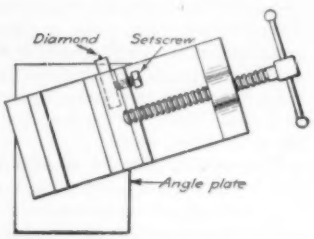




Compass Tool Cuts Gaskets

A HANDY circular gasket cutter for light materials can be fashioned from a regular draftsman's compass of the screw-adjusting type. One of the regular scriber points is ground down to a beveled knife edge.

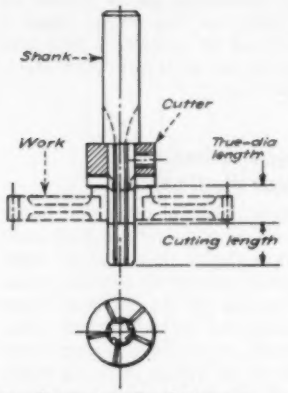
Sharpened like any knife blade, the point can be rechucked in the compass and used in place of a pencil point. With care, gaskets can be cut up to any size within the capacity of the compass. *Frank M. Butrick, Jr., Alma, Mich.*



Swiveling Vise Carries Grinding-Wheel Dresser

A HANDY grinding-wheel dresser can be made by inserting a conventional diamond-wheel dresser in a hole drilled parallel to the face of the jaw in the movable jaw of a swiveling vise. A suitable hole for a setscrew can be drilled and tapped through the rear of the jaw to intersect the dresser hole.

The vise can be attached to an angle plate and set on a surface-grinder table so it can be aligned to dress the wheel. Turning the vise screw will move the diamond across the wheel, *Victor C. Hasler, Elizabeth, N. J.*



Combination Tool Reams, Faces, and Chamfers

REAMING AND FACING with a combination tool when the tolerances on the hole are close is a tough problem. Any slight variation in the grinding of the facing edges will throw the reamer off center. One sure solution is to make the job into two operations, but this is not economical if it can be done any other, quicker way.

In a recent case, a simple change in the design of the tool not only eliminated this trouble, but doubled production, too. First, a true diameter—from 0.0002 to 0.0004 in. smaller than the OD of the reamer's cutting edges — was ground on the reamer. This was up near the shank, and was equal in length to the depth of the through hole being finished.

The work was a shoulder bushing on a small gear. After the hole had been reamed, the spindle of the machine was advanced until the cutting edges of the reamer were completely through the hole. With the true diameter to guide the face cutter, and with the aid of chamfering lips on the cutter body, the hole was completed within 0.001 in.

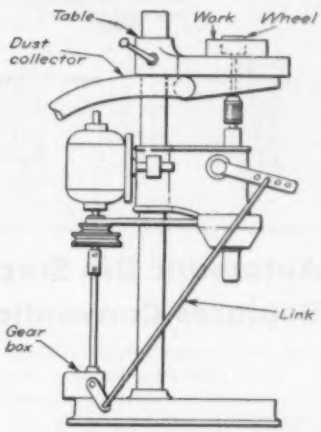
The cutter should have the same number (odd) of teeth as the reamer to equalize cutting effect and pressure. The chamfering lips were formed by grinding the blank cutter to the desired angle and depth, then grinding all the edges. *E. Westdal, Bloomfield, Conn.*

Inverted Drillhead Polishes Castings

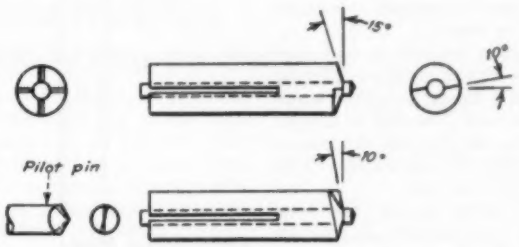
DIE CASTINGS with elongated openings 6 in. long and 3 in. wide with a 1½-in. radius on each end required a fine polished surface inside this opening. To speed up production we changed our method from hand scrapers and emery cloth on sticks to a drillpress that was adapted for polishing.

The complete motor-and-spindle unit was mounted upside down on the drillpress column, and a 50-to-1 reduction gearbox was mounted on the base and connected to the motor. The output shaft of the gearbox was fitted with a short lever that connected to a strap on the drillhead. This provided up and down reciprocating motion to the grinding wheel.

The drillpress table was mounted on the column over the drillhead with the spindle working through the hole in the table. Polishing was done with a 3-inch wheel, which was rotated directly by the drillhead. By adjusting the set of levers from the gearbox to the drillhead we could set the motion so it would just move the wheel up and down the right amount.



A dust-collecting arrangement was made to fit under the drillpress table to exhaust dust and chips to the regular collecting system in the plant. Production was increased with this method from 6 per hour to 30 per hour. *E. F Wallendorf, Lynbrook, N. Y*



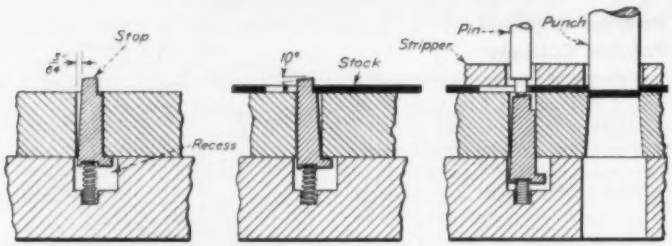
Piloted Counterbore Drills Thin Materials

THE TOOL illustrated has a pointed pilot pin that helps to drill sheet stock accurately and smoothly.

Slots in the rear of the cutter body allow chucking the tool, and also grip the pilot. This feature means that the pilot can be adjusted to protrude any amount.

The cutter has two edges which are located at 10° and are shifted 10° off a diameter through the cross-section of the body. This makes the cutter shear, which reduces chatter. The edges are also backed off at 15°.

The pilot is ground to cutting edges so a hole can be simply centerpunched, then drilled directly in one operation. Having a tool with two parts makes construction easy and simplifies grinding. *Martin H. Ball, Watervliet, N. Y.*



Automatic Die Stop Replaces Conventional Pins

THE ARTICLE on "Automatic Stops for Dies" (*AM* June 26 '50, p 80) did not mention the stop illustrated here, which was specifically designed for dies with spring strippers, but which can be installed on other kinds of dies, too. The stop replaces conventional pin stops on several dies in our shop, where it has increased production.

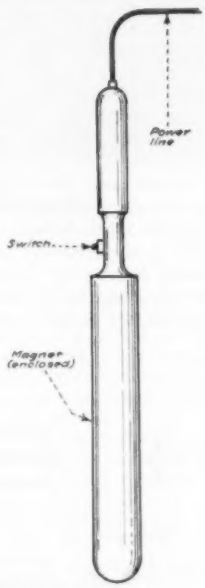
A pin mounted on the upper die shoe operates the stop. This pin can be a long setscrew, and should be slightly longer than the longest punch—about half the thickness of the stock longer. A compression spring backs up the stop, and when pin pressure is released, the spring brings the stop up.

Design of the stop is such that it fits a square hole—to prevent twisting. A lip on its bottom keeps it in the hole. The stop is tapered up to the top, but fills the hole at the bottom. This allows about 3/64 in. play at the top.

Stock feeds against the stop, pushing it to the left. As the ram drops, the pin depresses the stop into its clearance hole in the lower die. The top edge of the stop is beveled off to the left at about 10°, so the pushing action of the pin will force it to the right.

One or more punches should contact the work before the stop gets below the surface. This prevents the mechanism from over-feeding.

After the ram starts up again, the stop will be released by the pin and it will contact the bottom of the stock. As a previously punched hole passes over the stop, the stop snaps up. *O. Ernest Riegner, Philadelphia, Pa.*



Chip Pickup Made From Electromagnet

STEEL AND IRON CHIPS can readily be removed from slots in machine tables, from jigs and fixtures, and from workpieces themselves by a small electromagnetic wand equipped with a switch.

A small magnet like the one illustrated was made especially to remove chips from a blind hole in a casting which we were tapping. By pulling out chips every so often during the tapping cycle, we reduced tap breakage 50 percent. The same kind of magnet will work well on much larger work. The electromagnet is turned on to pick up the chips, then is switched off while it is held over a scrap barrel. *W. A. Court, Memphis, Tenn.*

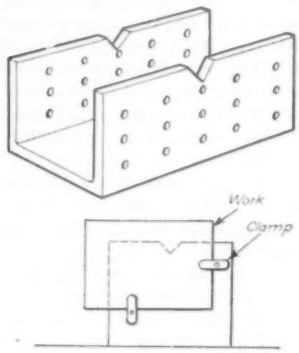
Layout U-Iron Holds Work Steady

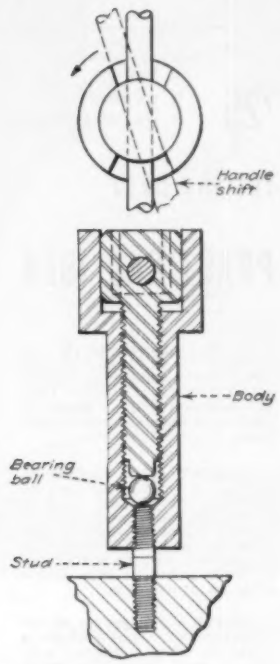
I HAVE a U-iron piece that is 3¼ by 3¼ by 4 in., and is shaped much like a double angle plate. Both vertical sides of the iron are drilled in regular patterns so small finger clamps can be bolted into place to hold a workpiece against either side of the fixture. This rig makes most accurate layout jobs much easier.

Work is first usually drilled and reamed to provide a locating hole that will act as a reference. The work is then clamped to one face of the fixture with its top parallel to the base of the fixture. Some area at the top and at one side is left projecting so these edges of the work can be ground. A pass with a surface grinder across the top of the work provides an accurate surface from which layout can be made.

For odd angles, a sine plate can be set up and the fixture can be clamped to its table. Simple layout lines, parallel to the top and side, can be scribed with a surface gage if the fixture is simply laid on the surface plate.

To simplify layout of round stock and shafts, V-notches are cut opposite each other on the two top edges of the fixture. *Joseph J. Sanzo, Ilion, N. Y.*





Hand Stud Driver Has Quick Action

TO DRIVE a small number of studs into production parts, we made a hand driver from a machined piece of round stock and a socket-head capscrew. These two parts, plus a ball from an old bearing, made up the assembly.

The head of the capscrew was drilled through to take a pin handle, and the body was slotted on both sides to allow about 30° of movement of the handle. Both the end of the screw and the hole through the body were seated for the ball.

A stud is screwed into the driver body when the handle is in the open position and is firmly seated against the ball. Then the stud is threaded into the work by means of the pin handle until it is tight. Shifting the pin backward, for the length of the slot releases the jamming action of the ball, and the driver can be easily removed from the stud after the stud is driven tight. *Kenneth L. Stottenberg, Milford, Mich.*

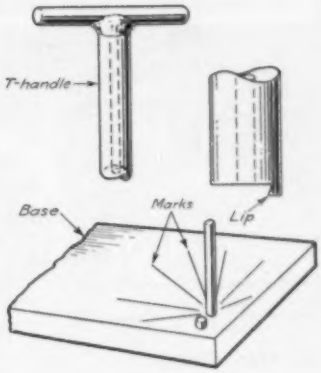
Springs Wound With Pin Fixture

SPECIAL WIRES and springs were usually quite a problem in our shop until I made the illustrated fixture. The base is a cold-rolled-steel plate with a hole drilled in it slightly smaller than the diameter of the spring to be wound, or the radius of the bend in the wire. This allows for springback.

Another hole is drilled the diameter of the wire away from the first hole and pins are pressed into both holes. The first pin is 3 or 4 in. high, but the second one protrudes only about the thickness of the wire.

A "T" handle is made by drilling a piece of drill rod to fit over the longer pin and brazing a handle to it. An undercut lip is filed on one side of the bottom of the drill rod, and the tool is hardened.

The "T" handle is dropped over a long pin and wire stock is inserted between the two pins. Wire is caught by the notch in the "T" handle and twisted to form either a bend or a spring. Radial lines



are scribed on the base so the wire can be twisted around to the same position each time. By observing these lines, we are able to form accurate springs so the whole lot is alike.

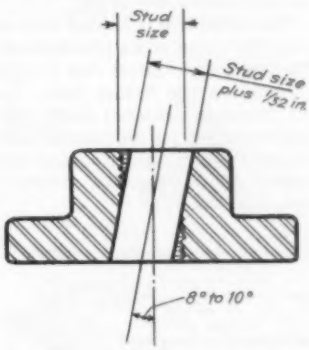
This same method will form small oval links and pear-shaped hooks. A new fixture must be made for each new size of wire, but these are quite inexpensive and simple to make. *R. J. Hartmeister, Golden, Colo.*

Altered Nuts Are Quick-Acting on Fixtures

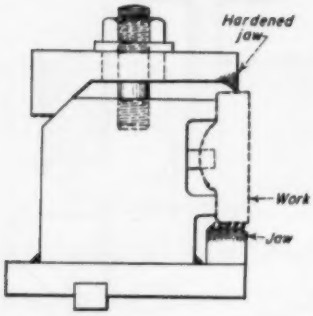
STANDARD HAND KNOBS or hex nuts can be easily altered so they can be assembled to or removed from long studs in a hurry. A hole 1/32 in. larger in diameter than the stud size is drilled or milled through the hand knob at an angle of about 10°.

This allows threading back the knob for a few turns, then tilting it and slipping it straight off the stud. The milling removes a large portion of the threads so the knob will slip easily. When the knob is pushed back onto the stud, is straightened out and threaded down, it will be held firmly in place by the face of a washer or a part of the fixture, because any face that the knob bears against which is perpendicular to the axis of the stud will hold the few threads in engagement.

This alteration can be made only



under conditions where the remaining threads will have sufficient strength to withstand the load. When new fixtures are designed, the studs and knobs can be made oversize to allow for this loss in strength. *Clement F. Brown, Lima, Ohio.*



Serrated Clamp Grips Casting

GRIPPING cast parts in a fixture is difficult before the parts have been machined unless there are special surfaces cast in the part for the purpose. This clamp will not only grip a casting, but will also draw it against the locating points on the fixture.

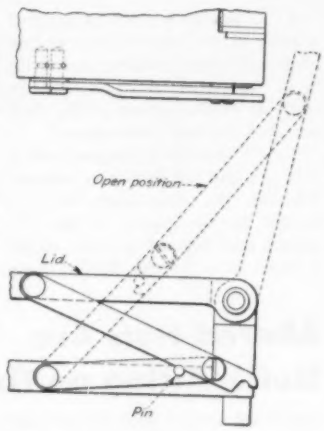
The top rear corner of the fixture block is shaped off at about 45° so the adjustable clamp will tend to slip backward as it is tightened. The clamping bolt works through a slot in the clamp strap, which allows this backward motion. Both the jaw on the clamp and the hardened fixed jaw on the fixture are sharp, and the fixture jaw is serrated with many teeth.

The workpiece is located over a pin, which slips into a hole through the piece, and against two milled surfaces on the fixture base. As the clamp is tightened down, the top single jaw on the clamp tends to pull the part tighter against the fixture. *H. G. Frommer, Milwaukee, Wis.*

Diamond-Carbide Laps Rework Drilled Centers

ACCURATE CENTERS required in hardened steel and nitrided products such as shafts, rolls, taps, reamers, and gages can be formed by lapping them with diamond-impregnated carbide laps. These laps, which are commercially available, usually perform best in materials that are harder than R. 62 or Bhn 600. The tools can be utilized on special center-lapping machines or on improvised drills. Laps should revolve at 1500 to 5000 rpm Lubrication is not usually required.

The technique is good for correcting out-of-round conditions, correcting wrong angles, and for removing scale and burrs. *Carboloy Co., Detroit, Mich.*



Stop Arms Control Heavy Jig Plate

A SIMPLE but effective lid stop for unusually large jigs is illustrated. Two arms are mounted on the sides of the jig and lid by studs, and are connected by a screw assembly. The arms are machined and fitted so they will swivel as the lid is raised, but will prevent the lid from falling backward too far, where it might interfere with other fixtures or a machine.

In the open position, a notch cut in the end of the upper arm contacts a pin driven into the lower arm to provide a positive stop. To provide good balance, arms should be attached to both sides of the jig where they will equalize wear on the regular lid pins. *Cliff Bossmann, Dayton, Ohio.*

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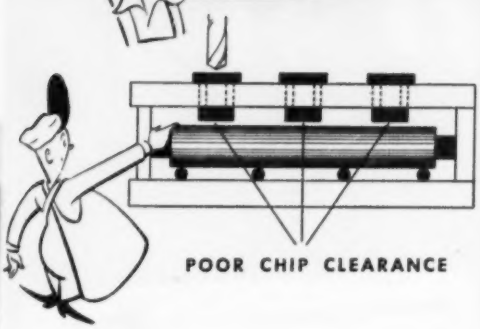
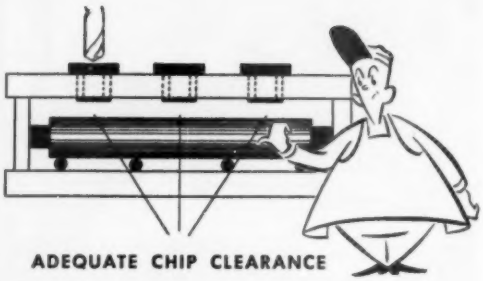
Design of Drill Bushings is Important

Stainless Sam says



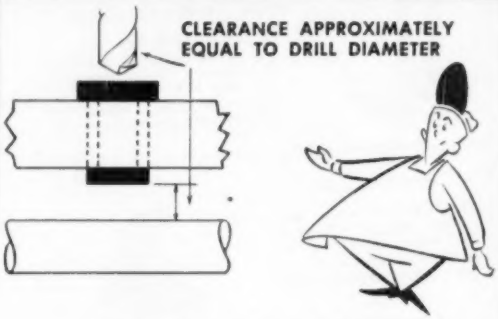
POOR CHIP CLEARANCE

1 A screw machine shop was having trouble with poor drill life and poor chip clearance. Stainless Sam learned the job called for transverse drilling of ¼"-diameter holes in 1¾"-diameter stainless steel bars. The sketch shows the original set-up of the jig.

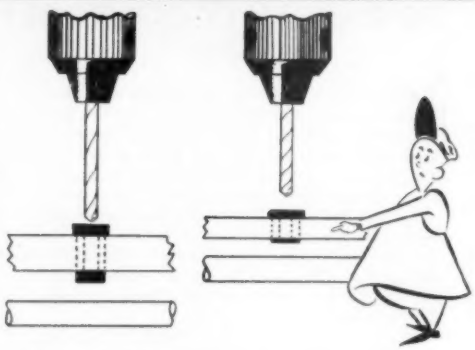


ADEQUATE CHIP CLEARANCE

2 This sketch shows the changes in bushing design recommended by Stainless Sam. *Drill bushings were ground away to permit adequate chip clearance.* This also eliminated the cause of excessive drill-breakage. In the original design, where chip clearance was inadequate, the drill was *forced to recut its own chips.*



3 When machining stainless steels, the minimum clearance between the bottom of the bushing and the work piece should be at least equal to the diameter of the drill, according to Stainless Sam. For example, a ¼"-diameter drill should have chip clearance of ¼". This may vary slightly with the accuracy of drill-location.



4 Bushings, however, should never be longer than the work requires. They should be as short as good machining practice permits, because short bushings make possible the use of short drills.

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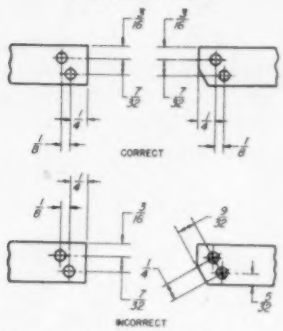
Rules for Dimensioning . . . IV

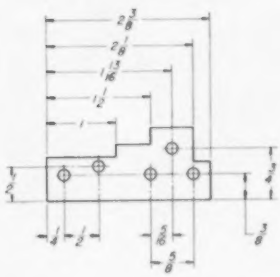
These practices are followed by the automotive industry

MATING PARTS



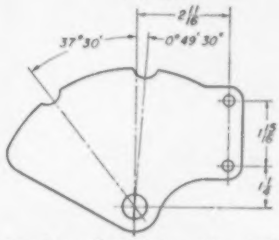
Mating surfaces, holes, etc., on related parts are dimensioned according to the same pattern to facilitate fabrication and to insure the desired fit of the parts.

DIMENSIONING FROM BASELINE



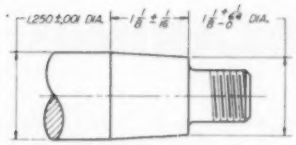
Generally, surfaces, groups of holes, etc., are located from a common baseline. This practice clearly indicates the requirements from a functional standpoint, and avoids an unnecessary accumulation of tolerances.

ANGLES



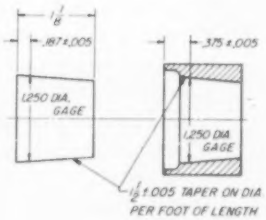
Angular dimensions are avoided wherever possible. Where linear dimensioning will not suffice, angles are expressed in degrees, minutes and seconds—never in fractions of degrees or decimals. On angles of less than one degree "0°" precedes the specification of minutes and seconds. Dashes are never placed between the terms of angular dimensions.

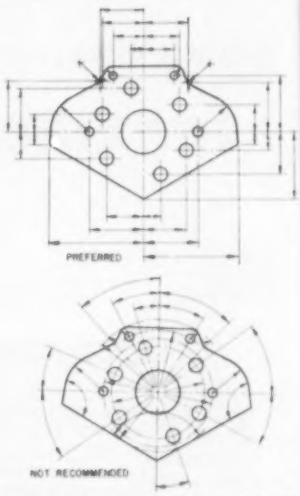
TAPERS



Tapers are used for various purposes, and consequently present different design requirements. In each case the method of dimensioning should clearly convey the requirement of the design. In the case of tapered portions of machined parts where the taper serves no purpose other than to provide a gradual reduction of section beween two functional surfaces the diameter at each end of the taper is dimensioned with the maximum permissible tolerance and a length is specified either as "approximate" or with a generous tolerance.

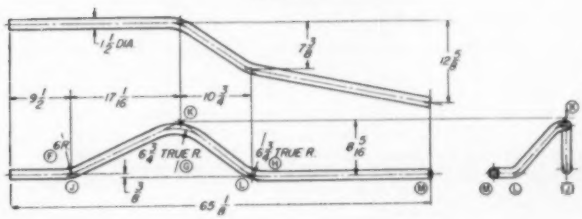
In the case of tapers which engage one another either permanently or intermittently, the mating parts are dimensioned by specifying the taper per foot with a tolerance and the diameter without tolerance located by a dimension and tolerance parallel to the axis.





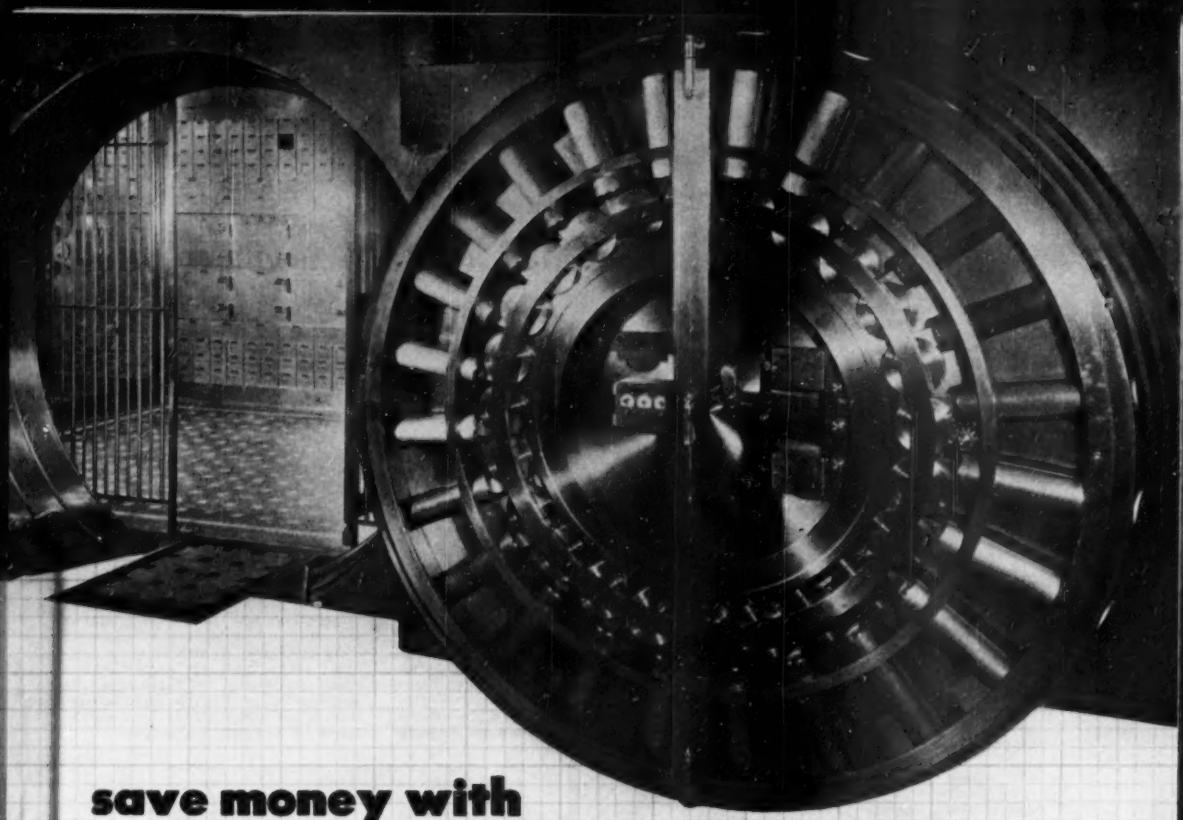
Angular relations are preferably dimensioned by ordinates and abscissa to eliminate the need for calculations in the shop, and to insure better control of tolerances.

TUBING BENDS



Avoid compound bends. Second and third bends from left could be compound, but are approximated by true radii at *G* and *H*. Hence, bends are true only in plane of bend—bend *G* in plane of points *J-K-L* and bend *H* in plane of points *K-L-M*.

Tubing is dimensioned to centerline, both at bend radii and bend location. Exceptions: If radius fits an adjoining part, it is dimensioned to outside or inside of bend. If bends are to be made on a single die, it is easier to specify inside radius.



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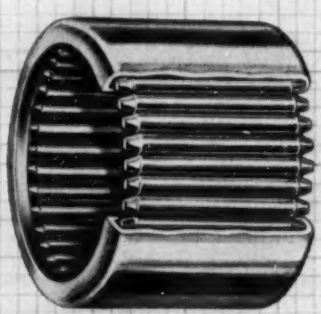

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Design of Arc Welding Fixtures...I

By H. G. FROMMER

FIXTURES for arc welding may be sub-divided into two groups: tacking fixtures (or setup fixtures) and welding fixtures. In some shops, mostly the larger ones, these two types are sometimes combined. Then, it is usually necessary to have two or more fixtures in order to keep up with production.

In smaller shops, or for lower production runs, one tacking fixture is normally sufficient for the following reasons: The setup and tacking operation usually takes only a fraction of the subsequent welding time. In such cases, efficiency is promoted by removing the tacked structure from the tacking fixture and fastening the work to positioners, or stands, or inexpensive holding fixtures. Several men then do the welding and increase the day's total produtcion. Furthermore, physical construction of a tacking fixture often curtails efficient welding by interference of locating devices with the welding electrode or by limited means of positioning.

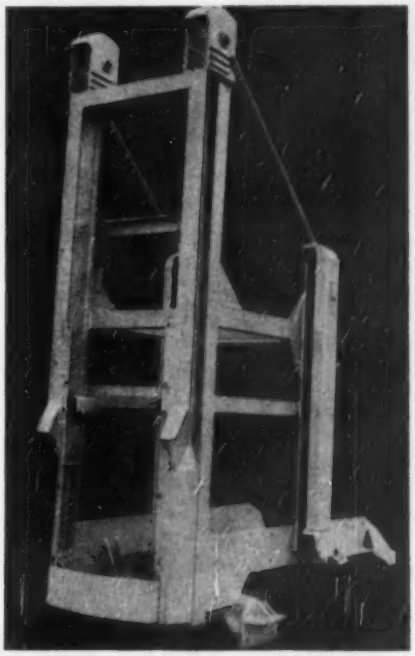
Tacking and welding fixtures are combined when:

(a) The welding time does not exceed the combined tacking and handling time and sufficient production may be achieved without any additional fixtures.

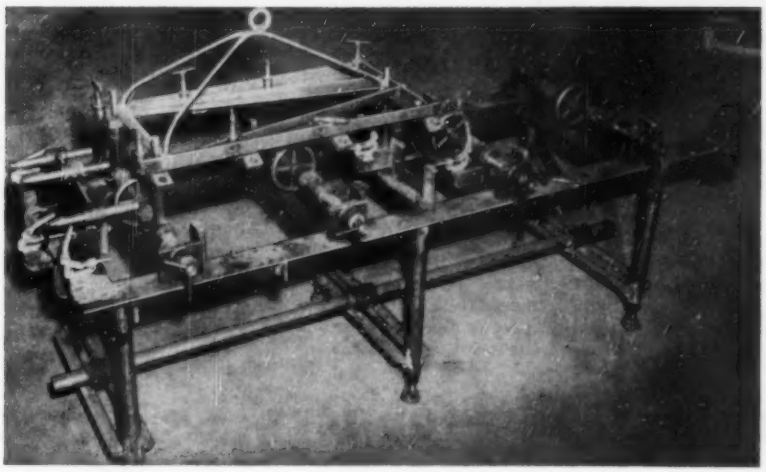
(b) Production is low and no discomfort is encountered by tying up the fixture during welding time.

(c) The weldments are small and/or simple and duplicate fixtures may be made at low cost.

Whenever combination fixtures are used, proper means of positioning must be provided, and they must be designed to allow the welder easy access to the joints.



Main frame of an excavating device was built in two major subassemblies; the front and rear frame weldments



Tacking fixture for the front-frame weldment features fully retractable locaters and quick-acting clamps. The "superstructure" locates front side strips by holes, which serve later for attachment of cast front guards

ONE OIL DOES WORK OF TWO

Dual-Purpose Sunicut Replaces Two Former Oils; Dilution Ends; Finishes Improve; Tool Life Lengthens

When one oil does work formerly requiring two . . . and with marked superiority . . . it doesn't make good sense to keep on buying two.

That is precisely why a prominent ball bearing manufacturer changed to Sunicut. He had been using one oil for lubricating his automatics, and another for cutting, but without complete satisfaction. The lube oil kept diluting the cutting oil by leaking into it. As a result, he got poor finishes and tool life was short. A Sun representative, called in to study the situation, advised using a dual-purpose grade of Sunicut. Adoption of his recommendation solved the problem.

For three years now, Sunicut has been used by the entire automatic department with complete satisfaction. A year ago a switch was made to the *new* Sunicut with Petrofac, Sun's revolutionary all petroleum additive, and even better performance has resulted.

The new Sunicut grades, transparent and non-emulsifying, have been thoroughly "Job Proved." Excellent results are being obtained on automatics machining all types of steel and brass at all practical feeds and speeds. For further information, call or write your nearest Sun Office.

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SUNOCO

Design of Arc Welding Fixtures...II

Welding fixtures, especially the larger ones, are now almost all made by welding of subassemblies and fastening them together. Welded fixtures are actually twice as rigid as cast-iron ones, and their strength is six times greater, and equal sections resist impact five times as well. The last fact is important because large tacking and welding fixtures are often bumped severely in handling by crane or hoist. The weldments should be thoroughly stress relieved, to avoid distortion, because heat will be transferred to them from clamps and locators. Also rough handling and aging will soon cause inaccuracies.

Tacking and welding set up internal stresses which tend to distort the weldment. Hence fixtures must be built strong enough to resist these forces, and locating devices must always be positioned in such a way that weld distortion does not cause binding at removal of the welded work from the fixture.

A larger tacking or welding fixture is generally made in sections for:

(a) Ease of manufacturing.

(b) Replacement of sections due to wear.

(c) Changes of sections to accommodate changes of product.

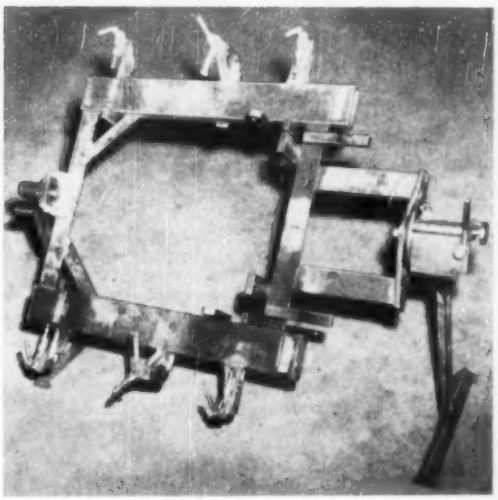
(d) Possibility of interchanging section for use on several weldments of similar designs.

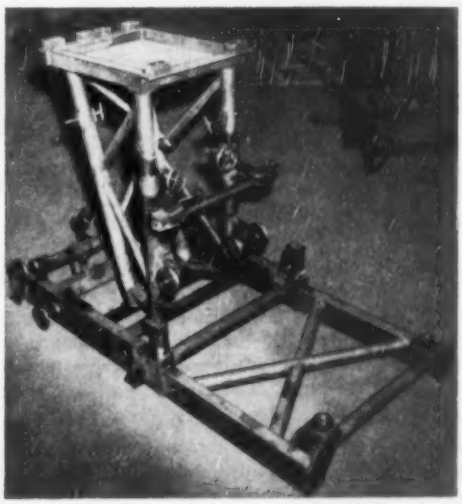
Keep in mind that that weld spatter calls for shielding of screw threads, limiting the size of locating surfaces so they are covered completely by the workpieces, and relieving of sliding pins and other parts to prevent seizing when spatter lands on them.

Clamping devices should be fast-acting and designed to be operated without wrenches. Handles must be large enough and long enough to allow manipulation by glove-covered hands. Wedge-type clamps are quite effective and more resistant to spatter than screw clamps. In addition, they are tightened and loosened with one of the welder's favorite tools—the hammer.

Locating devices should allow flexibility in changing locating dimensions as necessitated by design changes or to compensate for expected or experienced weld distortion. Locating spots must be chosen after subsequent machining operations have been considered. Often, welding and machining must originate at the same locating points.

A helpful feature is the incorporation of so-called "insurance pins." These prevent use of oversized workpieces and act as a flag for undersized ones. Use of insurance pins will assure accurate weldments, improve the appearance of the machined structure and is especially desirable when 100% parts inspection is lacking. Obviously, these pins are used only in locations where harm may arise through use of inaccurate parts.





Combination tacking and welding fixtures, left, was used for the rear-frame weldment, since welding was minimized here by welding the upright channels in a subassembly fixture. Right—Tacking fixture for assembly of front and rear frames has quick-clamping and releasing locaters. Side braces and various loose parts are added to the assembly while it is clamped in position in this fixture

Blue it...

Mark it...

Saw it...

. . . that's all you have to do with

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FLAT GROUND DIE STEEL

(Flat Ground Stock)

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You can bank on this *oil hardening, non-deforming* type flat ground steel to be uniformly annealed and to have a uniformly low micro-inch surface finish needed for accurate layout work. Ends of the standard 18" lengths are milled square. No machining operations are required to size Simonds "Red Streak" Flat Ground stock and Die Steel . . . so you save time and money right from the start.

Another feature is its wide hardening range (1450° to 1540°) which insures consistently uniform results. Each piece is individually packaged, plainly marked as to size, and includes heat-treating instructions. Now furnished in a wide range of sizes up to 36" x 10" x 1½", you can get immediate delivery of most sizes from your Simonds Distributor.

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TALKING SHOP

Health—By Fiat

IN SEVERAL PLANTS we've visited recently, normal medical equipment is supplemented by rubbing table, sunlamp, and like equipment for executives. This is not done to give them privileges, but rather to "needle" them into taking necessary exercise. In one company, each executive has a scheduled time for a weekly visit and is checked by a trainer. If he is overweight, diet and exercise are prescribed—even including visits to a local gymnasium if necessary. The company president believes strongly in this program, and the "moral" pressure has been strong enough to make it work.

Benefits are less sickness and greater efficiency in administrative posts—and early detection of health problems that might cause premature death for the man—and resulting difficulties in replacement.

Small-part Storage

STORAGE of shoulder capscrews, dowel pins, and other small parts used in die work can be haphazard or shipshape. In an example of the latter, one shop uses steel bin racks, one bin per size. In each bin is thrown a brass tag with the product size marked on it. The whole arrangement is much more tidy than stacking boxes of such parts on shelves, and considerable time is saved in finding and passing out the requisitioned items.

Men Wanted

STEWART-WARNER, by contract with the IBEW, posts on plant bulletin boards a list of "open" jobs. In one month, 46 employees moved up one or more labor grades into such jobs. Procedure is for the employee to fill out an application form, giving his qualifications for a job posted as "open." In one case, a helper on an automatic screw machine (10th labor grade) got a job as a painter (6th labor grade).

Now, when a job opens up, the foreman notifies Personnel, which posts it. Applicants get blanks from foreman or union steward and send them to Personnel direct or through stewards. Applications are screened by Personnel and the foreman concerned.

Reel Hose

COMPRESSED-AIR HOSES on automatic windup reels can be placed under the diemaker's bench. Here they are out of the way when not needed, and do not present the untidy appearance of hanging hoses.

Precise Magnetism

BUREAU OF STANDARDS has come up with an improved magnetic permeameter, capable of testing magnetic materials at magnetizing forces up to 300 oersteds. Put in simple words, this is a gadget for accurate determination of magnetic properties. While most commercial permeameters are really comparators (must be referred to a standard), this one doesn't have to be calibrated. It is highly accurate and as convenient as commercial units. It is called the M H Permeameter, was developed by R. L. Sanford and P. H. Winter.

Humid Spray

AT PEARL HARBOR, late in World War II, some difficulty was encountered in obtaining good bonds in sprayed metal. Analysis indicated that the bond was good one day, poor the next. The best theory advanced was that humidity was the offender. On very humid or rainy days, bond was appreciably poorer than on dry days.

Red Inventory

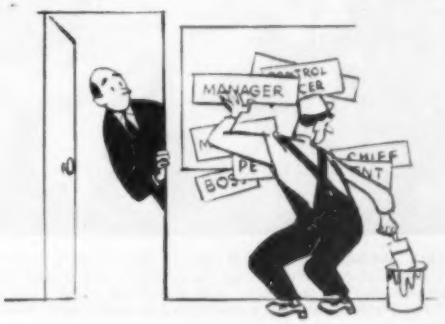
RUSSIAN AUTHORITIES, according to the Associated Press, have ordered an industrial inventory in their zone of Austria. Firms which fail to comply are threatened with "appropriate military justice." Quite a contrast with our own *AM* Inventory, taken without pressure on anybody except our editors.

Moving Alignment

OLDSMOBILE has just installed a toe-in wheel-alignment machine on its final-assembly line in Lansing, Mich. Two operators in a pit under the line set toe-in while the car moves 12 ft. down the pallet-type conveyor line. An arm on the machine engages the car, while two gage arms move up and bear against two points (front and rear) of each front-tire inner wall while the tires rotate ½ turn. The operator can read a gage, then operate an air tool to set adjusting sleeves within plus or minus 1/16 in. The machine centers itself on the car automatically, thus positions the steering wheel accurately.

Titles

A RECENT SURVEY indicates that 370 "manpower managers" — personnel executives—have 44 distinctive titles. Actually, minor variations make the number more nearly 100 types of titles. Most frequent title is personnel manager or personnel director (51%), next commonest is industrial relations director (12½%).



News of Metalworking

MORE GAS TURBINES—Large-scale output of gas turbines has been started by General Electric in Schenectady, plant facilities now being equipped at cost in excess of $4 million. Accelerated production has begun on first few of more than 20 gas turbines scheduled to be built within next two years.

AMPLE TOOL CAPACITY—The machine tool industry has far larger capacity than at start of World War II, and could be expanded to meet twice present demand, Charles J. Stilwell, president, Warner & Swasey Co., Cleveland, said August 15 over ABC stations. He spoke on a program presented by the Industrial Mobilization Committee of National Association of Manufacturers.

"Upon the mobilization of the machine tool plants of the country," he said, "the only bottleneck to develop will be one of time—but not of potential capacity."

V & O PRESS SOLD—V & O Press Div. of Rockwell Mfg. Co. has been purchased by Hartford-Empire Co. The Hudson, N. Y. plant will continue under management of Herman F. Zorn and no personnel changes are contemplated.

ASME TO MEET—Fall meeting of ASME will be held September 19-21 at the Hotel Sheraton, Worcester, Mass. Some 50 papers will be delivered at 24 technical sessions.

Skilled Labor Shortage Threatens As Plants Gird for Defense Work

WASHINGTON—Evidence of a tightening labor supply continues to pile up:

- **Reports reaching** U. S. Employment Service show a shortage in at least one "critical occupation" in each of the country's industrial areas.
- **Tool and die makers** are unavailable in 24 states.
- **Aircraft engineers** needed for tooling up and expansion can't be found.

A new policy for reconciling industrial and military demands for special skills through deferment of certain skills among reserve officers and National Guardsmen is being studied at the White House.

A test sample of how industry would be affected if all reserve officers and National Guardsmen were called to duty was made in 12 plants in Hartford, Fort Worth, San Diego, South Bend and Birmingham and in all of York, Pa. It showed that, on the average, the plants would lose one out of five of their professional, managerial and skilled personnel. The ratio varied widely, however, from plant to plant.

USES has alerted local and state employment offices to give special attention to labor needs of war contractors and suppliers. Employers were urged to hire through USES-state operated offices to minimize disorder in the labor market.

Thus far, much of the labor supply problem is a local problem. Men and skills are not in the right places. USES has been asked by state offices to look in other states for men to fill more than 25,000 jobs which can't be filled from the state's own labor pool.

The story of the skilled labor shortage is told in newspaper classified advertisements. These are typical:

- **Milwaukee** — Harnischfeger Corp. offered jobs to operators of turret lathes, milling machines, engine lathes, grinders, radial drill presses, shafting lathes, planers, screw machines, boring mills, Gisholt Simplimatics.

General Electric X-Ray added a need for men skilled on shears, press brakes, and drill presses. Machine helpers were sought, also.

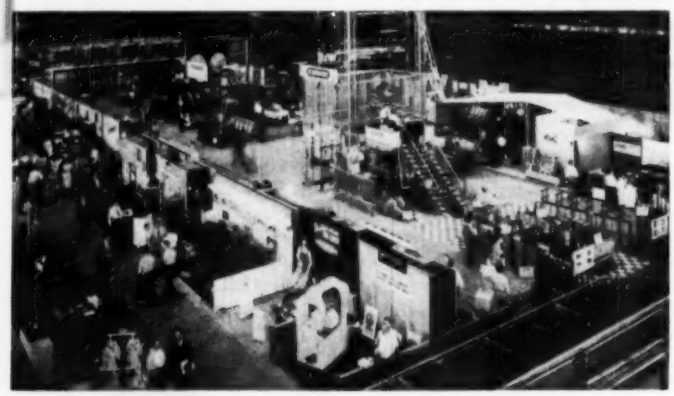
Wisconsin Grey Iron Foundry Co. sought handymen, molders, coremakers, chippers, grinders, cranemen.

- **Detroit**—A new De Soto body plant sought assemblers, slot welders, torch solderers, metal finishers, tool engineers, pipe fitters, millwrights.

The Dodge main plant needed die sinkers, die makers, tool machinists, wood pattern makers.

Fisher Body was after jig and fixture builders, die designers, wood pattern makers, boring mill operators.

- **In Los Angeles** the machinist situation is critical. Roy Brown, regional vice president of IAM told AMERICAN MACHINIST that the situation in the San Francisco area and in the Los Angeles aircraft industry "has reached the point where there are few available A-1 machinists for hire."
- **Cleveland** — When some 8000-9000 persons stormed employment gates of the Cadillac tank plant here August 21 seeking the approximate 5000 jobs open, it surprised most of Cleveland's established industries who are experiencing difficulties in securing sufficient skilled labor now. There are shortages in every field dealing with defense production.



THE WORLD SHOPPED for 14 days last month in Chicago at the First United States International Trade Fair, where 2000 foreign and 500 U. S. companies showed consumer and industrial goods. German, British, Swiss, and Yougoslavian exhibitors reported big on-the-spot sales. (*Oscar photo*)

Multi-Million Dollar Contracts Among August Defense Awards

WASHINGTON—As defense mobilization picks up momentum, some of the truly big contract awards are beginning to appear in listings released by the Department of Commerce. Awards for August, valued above $100,000, are reported here:

ARMY

Cadillac Motor Car Div., General Motors Corp., Detroit, light tanks, $110,000,000.

Continental Motors Corp., Detroit, gas engines, spare parts, $5,000,000.

American Car & Foundry Co., New York, howitzer motor carriages, $30,000,000.

Caterpillar Tractor Co., Peoria, Ill., tractors, bulldozers, power control units, $672,080.

International Harvester Co., Chicago, commercial dump trucks, 5-ton and spare parts, $113,411.

Barber-Green Co., Aurora, Ill., asphalt plants, $532,296.

Breeze Burners, Inc., Chicago, oil burner stoves, tent, $176,455.

Harrison Sheet Steel Co., Chicago, steel section furniture, $210,974.

Thomas A. Edison, Inc., West Orange, N. J., servo motors, $122,930.

Butler Mfg. Co., Minneapolis, water tanks, 700 gal., for 2½-ton trucks, 6x6 LWB, $522,550.

Union Carbon & Carbide Corp., National Carbon Div., New York, batteries, $1,707,000.

National Forge & Ordnance Co., Irvine, Pa. tube forging for guns.

Espey Mfg. Co., New York, radio terminal sets, $1,734,569.

Western Electro Chemical Co., Culver City, Calif., pilot run industrial preparedness contract, $264,000.

General Electric Co., Syracuse, N. Y., detector sets, $2,019,577.

Pollak Engrg & Mfg. Co., Newark, N. J., antenna supports, $135,384; modification of shells, $254,400.

High Standard Mfg. Corp., Hamden, Conn., slide, operating (Carbine cal. .30 M2), $644,663.

Rheem Mfg. Co., Southgate, Calif., gasoline drums, 5-gal., $1,341,000.

Motorola Inc., Chicago, Motorola radio set, $961,737.

General Dry Batteries Inc, Lakewood, Ohio, batteries, $323,750.

Espey Mfg. Co., Inc., New York, radio relay sets and terminal sets, $726,909.

Aerial Products, Inc., Elkton, Md., igniting fuses, $126,748.

Hercules Powder Co., Wilmington, Del., squib, electric, M1, for igniter rockets, $163,404.

U. S. Rubber Co., Bristol, R. I., wire, $1,110,000.

Overlake Corp., Lowell Insulated Wire Div., Lowell, Mass., wire, $425,502.

Rex Corp., Cambridge, Mass., wire, $429,343.

Standard Cable Corp., Chickasha, Okla., wire, $2,932,000.

Okonite Co., Passaic, N. J., wire, $696,600.

Plastold Corp., New York, wire, $821,656.

Phelps-Dodge Copper Products Corp., New York, wire, $1,360,000.

AIR FORCE

Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, N. J., transmitters, fuel pressure, $128,511; transmitters, multi-purpose, $153,363; indicators, hydraulic pressure and oil pressure, $326,772; indicators, fuel pressure, $97,448; power amplifiers, compass signal, $312,760; indicators, directional heading, vert., settable dial, $377,928; electric indicators, vert. gyro, $1,134,035; aircraft accelerometers, 3-position, $131,826.

Square D Co., Kollsman Instruments Div., Elmhurst, N. Y., multipurpose indicators, $88,149; indicators, electric tachometer, $85,-827; indicators, air speed, pitot-static, sensitive, $371,359; indicators, rate of climb, $165,165.

North American Aviation, Inc., Los Angeles, misc. assemblies, subassemblies, kits and spare parts for govt aircraft program, $510,000; engineering changes, funds for F86E spare parts, $500,000.

Kearfott Co., Inc. New York, components of N-1 compass spare parts, $1,872,016.

Sperry Corp., Sperry Gyroscope Div., Great Neck, L. I., N. Y., components of slaved gyro magnetic compass, $2,291,659; gyro compass components, $1,631,444; components of type E-6 auto pilot, $1,124,154; engine analyzers, $1,080,400.

Schwien Engrg Co., Los Angeles, indicators, turn and bank, electric, $137,940.

Jack & Heintz Precision Industries, Inc., Cleveland, VA inverters, $122,265; starter, aircraft, direct cranking, $177,350; VA inverters, $519,702; VA inverters, $268,260.

Hartman Electrical Mfg. Co., Mansfield, Ohio, AMP reverse current cutouts, generator over-voltage relays, $175,763.

Sorensen & Co., Inc., Stamford, Conn., power units, $105,868.

Fairchild Engine & Airplane Corp., Ranger Aircraft Div., Farmingdale, L. I., N. Y., electric power plant aircraft accessories, $1,227,-000.

Eicor, Inc., Chicago, KVA engine driver alternators, $252,900.

Westinghouse Electric Corp., Lima, Ohio, alternator assemblies, $217,800.

General Electric Co., Schenectady, N. Y., AMP generators, $564,609; turbosuperchargers and turbo regulator spare parts, $979,806.

Bell Aircraft Corp., Buffalo, reclamation of QF-63 aircraft, $240,000.

Goodyear Aircraft Corp., Akron, Ohio, tank assemblies, jettisonable external fuel; turbosuperchargers, $829,800.

Boeing Airplane Co., Seattle, acquisition, modification, installation and repair of B-54 and C-97 aircraft, $700,000.

Lear, Inc., Grand Rapids, Mich., auto pilots, components, $5,783,756.

Bendix Aviation Corp., Bendix Products Div., South Bend, Ind., wheel and brake assemblies, $1,781,469.

Seaboard Electric Co., New York, servo controls, $227,520.

W. L. Maxson Corp., Maxson Engrg Div., New York, amplifiers, $125,780.

Minneapolis-Honeywell Regulator Co., Minneapolis, components for type E-6 auto pilot, $391,958.

Sikorsky Aircraft Div., Bridgeport, Conn., misc. assemblies, subassemblies, and spare parts for maintenance and overhaul of transmission systems for aircraft, $200,000.

Douglas Aircraft Co., Inc., Santa Monica, Calif., allocation for engineering changes for C-124A, $2,696,250.

General Motors Corp., Allison Div., Indianapolis, spare parts for V-1710 engines used in F-82 aircraft class-021, $560,000.

B. F. Goodrich Co., Akron, Ohio, miscellaneous fuel cells and deicer shoes, $120,000; wheel assembly, main landing; brake assembly, duplex, $2,281,150.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind. master controls, fuel injection system, nozzles, $6,765,856.

Bowser, Inc., Ft. Wayne, Ind., tank assembly, fuel, aluminum alloy jettisonable external, $973,180.

Lite Mfg. Co., New York, E-18 sustenance kit, $174,100.

Republic Aviation Corp., Farmingdale, L.I., N. Y.: misc. assemblies and subassemblies, kits and spare parts for govt. program aircraft, $358,782; F-84E airplanes, $7,500,000; F-84E-5 RE model airplanes, spare parts, $47,674,526; F-84F airplanes, spare parts, $34,900,000; RF-84F airplanes, $3,200,000.

American Machine & Metals, Inc., U. S. Gage Div., Sellersville, Pa., transmitters, hydraulic pressure, $255,285 transmitters, oil pressure, $327,109.

Leland Electric Co., Dayton, Ohio, VA single phase inverters, $115,140.

Avco Mfg. Corp., Crosley Div., Cincinnati, rack assemblies, electrically operated, $1,143,-000.

NAVY

W. L. Maxson Corp., New York, servo unit assemblies for use on aviation armament, $799,539.

Devenco, Inc., New York, design and engineering of tool equipment, $195,000.

Societe Anonyme Belgii de Mecanique Et d'Armement (MECAR), grenades, $108,000.

Forgee Metal Products, Inc., Paulsboro, N. J., stowage cabinets, $101,605.

Leahner Corp., Hamilton, Ohio, wiping cloths, $189,618.

New York Rubber Corp., New York, Kit, PK2 for use on various aircraft, $494,080.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., wheel brake and strut assemblies for use on PO-1W, P7U-1 aircraft, $139,605.

Wright Aeronautical Corp., Wood-Ridge, N. J., services and material to operate govt. owned Wright-designed aircraft engines, $150,-000.

Cleveland Pneumatic Tool Co., Cleveland, main shock strut for use on R4Q-1 and F7U-1 aircraft, $324,019.

Bendix Aviation Corp., Bendix Products Div., South Bend, Ind., carbureter assemblies for use on Pratt & Whitney engines, $344,239; shock struts for F9F-2-3 aircraft, $158,181.

Packard Motor Car Co., Detroit, one prototype 600 hp 17-cyl diesel engine, $400,000.

General Electric Co., Washington, D. C., insulated stator rewind kits; and rotor and pole assemblies, $100,000.

Naylor Pipe Co., Chicago, steel pipe, spiral weld, $159,460.

York Corp., Los Angeles, flake ice machine, spare parts and export packing, $139,176.

Cleveland Pneumatic Tool Co., Cleveland, strut assemblies for P4M-1 aircraft, $389,831.

Airsearch Mfg. Co., Los Angeles, main shut off valves for F9F-2, 3, 4, 5, 5P aircraft.

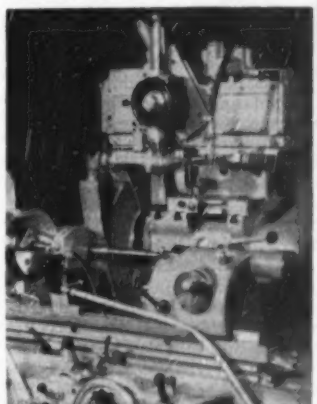
National Battery Co., Depew, N. Y., torpedo propulsion batteries, $631,989.

Panish Controls, Bridgeport, Conn., depth charge release controls, $312,400.

Carrier Corp., Syracuse, N. Y., refrigeration unit, $270,680.

Pacific Iron & Steel Co., Los Angeles, building, $512,400.

Anderson-O'Brien Co., Los Angeles, electric generators, $189,176.



CONSTANT SIZE CONTROL during entire grinding cycle is obtained with German Fortuna Werke cylindrical grinding machine. Wheel feed operates at pre-selected speed up to pre-set amount (0 to 0.003 in.) above finish size. Feed rate then is automatically reduced for sparkout and finish grinding. When final size is reached, the sizing gage causes wheel feed and work rotation to stop and wheel slide to recede. Hydraulic profile grinding wheel truing device allows truing with cylindrical, conical, stepped, or curved surface. Combination of form-wheel plunge-cut method with Finitor automatic sizing device insure precision of ±0.00004 in. *(not 0.0004 in. as incorrectly reported in A.M., May 29).*

German Tool Exports Up, But Industry Faces

Tool output lags behind total machine production; Germans champ at U. S. restrictions, Iron Curtain

By JOHN J. CHRISTIE
(McGraw-Hill World News)

FRANKFURT—West German machine tool builders are beginning to arouse anxiety among their erstwhile foreign competitors.

Exports indeed have taken a sharp upswing. Prices are lower than most foreign competitors. There's a marked improvement in quality.

Still the condition of the German machine tool industry looks better at a distance than it does close-to. Here are some problems hampering recovery:

1. Poor domestic sales due to tightness of credit.
2. A still uncertain foreign trade pattern.
3. Difficulty importing urgent machine tool needs from the U.S.
4. An uphill fight to close gaps in the range of machine tool output caused by the "iron curtain".

• **Production:** While west Germany's overall machinery production index had climbed to 116% of 1936 in May, output of basic machine tools was a mere 67% and of related equipment 71%. (See table below.) Only in March was the index higher.

Depressed domestic buying power is chiefly responsible. For, irrespective of export possibilities, west Germany's machine tool plants should be operating full blast just to meet industry's desperate need for rehabilitation and modernization.

Improvement in capital formation has been very gradual in the two years since the drastic currency reform. It was inevitable that the long unsatisfied demand for consumer goods would curtail private savings. However, the outlook lately has improved some due chiefly to tax reforms i.e. incentives to save and deductions for capital improvements. The recent lifting of the moratorium on foreign investments also may improve industry's credit resources.

• **Exports:** Western Germany's machine tool exports for the first quarter of this year are more than double the 1949 quarterly average. The 1949 export figure (which then covered rolling mill equipment as well) was 42,658,000 DM ($11,407,000). For the first quarter of this year machine tool exports alone amounted to 26,230,000 DM ($6,252,000) and rolling mill equipment accounted for 2,069,000 DM ($467,000).

The marked upswing is somewhat paled, however, by pre-war Germany's 1936 export of 124 million RM worth of machine tools and 24,020,000 RM worth of rolling mill equipment. (The RM had roughly the same value as the DM, but, of course, the pre-war value represented considerably greater volume.)

Present pattern of west Germany's exports deserves special note. Last year 71.9% of the new republic's total machinery exports went to countries in the ECA orbit, as compared to 45% for pre-war Germany. On the other hand, the percentage of exports to eastern Europe (Soviet satellites) was 10.6% compared to 26% pre-war, to South America 5.4% as against 10% and to Asia 4.1% compared to 8.7%.

Thus, German manufacturers of capital goods have been cashing in on the sellers market nurtured by the Marshall Plan in western Europe. But, they still have a long way to go toward regaining eastern European, South American and Asiatic markets.

The re-adjustment toward a more normal pattern is moving slowly. For example, percentage of exports to ECA countries was 81.2% in 1948, 71.9% last year; 60% is seen for 1950.

Machine tool exports, however, have deviated from the pattern in respect to trade with Hungary and Czechoslovakia. These satellite countries took a fourth of last year's machine tool exports, while trade with South America, Asia and other overseas countries followed the same low level as general machinery exports.

West German Machine Tool Exports

1948*	RM/DM 7,968,000		$2,477,000
1949	42,658,000		11,407,000
1 Quarter 1950	26,230,000	Machine Tools	6,252,000
	2,069,000	Rolling Mill Equipment	467,000

• **Restricted List:** The large percentage of west German machine tool exports going to Hungary and Czechoslovakia last year requires explanation, in view of the touchiness of this subject on both sides of the Atlantic.

In the first place, administration of the restricted list (which is identical with the U.S. one) has been in the hands of Allied officials until just recently. All west Germany's eastern European trade matters, in fact, are subject to special Allied supervision.

American officials report that, in the course of trade pact negotiations with the satellites, up to 40% of the requests for capital goods have been denied consideration due to conflict with the restricted list. Moreover, they say that 20% of the export license applications made by German firms last year were turned down for the same reason.

No one denies the possibility of "back door" deliveries in view of western Germany's several international borders and the fact that the republic itself is split between east and west by an artificial border. Also, it is recognized that neighboring countries provide convenient means for trans-shipment deals.

WEST GERMAN MACHINE TOOL PRODUCTION INDEX

(1936 = 100)

	1949 monthly average	Jan.	Feb.	Mar.	Apr.	May
Metalworking machines, cutting	58	61	63	66	59	68
Metalworking machines non-cutting	53	48	48	76	68	58
Total:	55	56	58	69	62	64
Thread cutting & rolling tools	81	78	75	80	67	70
Hard metal tipped precision tools	78	55	48	64	61	61
Other machine & precision tools	78	71	67	80	67	71
Total:	78	71	67	79	67	71

* Preliminary

Obstacles

So, although leaks are possible due to geography if nothing else, the relatively high percentage of machine tool exports to the two satellite countries cannot be attributed to failure to apply the U.S. restricted list. Eastern Europe inevitably turns to its former chief trading partner for whatever capital goods it can obtain. And, like other areas hard-pressed for dollars, it will seek in the U.S. only what it can't get in neighboring countries.

There may be some misgivings over the recent directive making the German government responsible for enforcing compliance with the restricted list. This is because of the extreme sensitivity among German firms over the loss of eastern trade.

Furthermore, the Germans claim and, with justification, that while they must adhere to the stringent U.S. list, some of their European competitors are subject to lists representing only 70% of the U.S. embargo.

The Germans, however, are subject to still another control which has an important bearing on the satellite embargo policy. This is the list of machine tools, the manufacturer of which even requires licensing because the items are prima facie in a category bordering on war potential.

• **Competitive Position:** Although the Germans see a number of dark clouds in their export picture, there's at least one silver lining and that's their prices. On the average, German machine tool prices are lower than the U.S. by about 50%, the Swiss by 30% and the British by 25%. They are about on par with French and Italian prices.

Lower wages are responsible for the German price advantage. Because the wage line has been held, west German manufacturers have been able to overcome adverse cost factors arising from poor condition of equipment, reconstruction and high taxation.

The average skilled worker in a German machine tool factory roughly earns in marks what his American counterpart is making in dollars, for example, 1.40DM (33 cents) as against $1.40 per hour.

• **Imports:** West German industry has been unable to utilize the full ERP dollar allocation for import of U.S. machine tools because it couldn't raise the mark equivalent that has to be paid into its government's counterpart fund.

The German manufacturer has to pay cash on the line when he receives equipment under ERP. In a number of other countries, however, the governments are able to extend credit to their industries to cover ERP procurements.

Last year's machine tool allocation amounted to $4,333,000 of which only $2,614,000 was taken up. Allocation for the first six months of this year was $3,410,000, of which $2,710,000 had been spent by end of May.

The situation is somewhat improved, therefore, but was still considered critical enough for industry representatives to draft a recent memorandum to the Bonn government asking for relief.

Industry does receive loans out of counterpart funds for rehabilitation and modernization. But, due to high priority reconstruction matters, like housing, the counterpart funds available to industry are few.

• **Western migration:** Unfortunately several lines of machine tools were produced exclusively in what is now the Soviet zone. This has left a gap in the range of German machine tool output that isn't easy to fill in the face of western German conditions now.

Some 20 or more east zone firms are now "in business" west of the "iron curtain". But, the trouble is that many of them are in the west in little more than name only.

The east zone manufacturer and perhaps a few of his key technicians who manage to escape to the west obviously can only bring with them blueprints and drawings.

• **Technical trends:** Not so long ago west German machine tool manufacturers could be content with production of pre-war models. It satisfied their hard-up domestic and neighboring European customers. Furthermore, a year ago, German manufacturers were reluctant to come out with new developments even if they had them because there was no patent protection.

But, now that competition, both domestic and foreign, is getting back to normal, quality is counting for something again, as shown in recent machine tool exhibits.

• **American Participation?** The moratorium on foreign investments was lifted just recently but without provision for transfer of earnings. No significant infusion of new money capital is expected, particularly not from anonymous investors.

There is considerable speculation in German industry circles nowadays as to the possibility of American machine tool makers and related industries having certain machines made in Germany for sale here, but particularly for export. The attraction, of course, would be the low wage scale. The idea undoubtedly is based on the feeling that U.S. manufacturers are going to have difficulty staying in certain foreign markets after ERP ends.

WEST GERMAN MACHINE TOOL PRODUCTION

(in metric tons)

	1949 monthly average	Jan.	Feb.	Mar.	Apr.	May*
Metalworking machines, cutting	2,970	3,433	3,571	3,698	3,325	3,864
Metalworking machines non-cutting	1,778	1,632	1,633	2,554	2,282	1,946
Total:	4,748	5,065	5,204	6,252	5,607	5,810
Thread cutting & rolling tools	116	112	108	115	96	101
Hard metal tipped precision tools	35	24	21	28	27	27
Other machine & precision tools	718	654	615	736	620	654
Total:	869	790	744	879	743	782

Share of Exports Taken by Major Buying Countries

	1948 RM/DM	1949 DM
Great Britain	1,744,000	2,119,000
France	395,000	3,929,000
Netherlands	663,000	3,586,000
Saar District	49,000	770,000
Denmark	266,000	376,000
Sweden	523,000	3,632,000
Italy	180,000	2,109,000
Turkey	—	154,000
Switzerland	1,765,000	4,286,000
Austria	58,000	1,535,000
Czechoslovakia	457,000	4,542,000
Hungary	14,000	6,255,000
Union of S. Africa	55,000	195,000
India (Dominion)	54,000	676,000
U.S.A.	264,000	509,000
Brazil	296,000	819,000
Belgium	920,000	3,071,000

* 1948-49 export figures included both machine tools and rolling mill equipment. 1948 and first nine months of 1949 represent only US-British bi-zonal area but later inclusion of French zone meant no more than 10% additional capacity.
West Berlin not included before 1949.

Lee O. Witzenburg

Gunner E. Gunderson

Chester M. Adams

Albert L. Gutterson

Names in the News

Lee O. Witzenburg has been named general sales manager of Cleveland Worm & Gear Co. and its subsidiary, Farval Corp. He had been sales manager of the Tann Corp., Detroit, and previously sales manager, V-Belt Div., Gates Rubber Co.

Wren Malone has joined the sales staff of the Chicago branch of Enterprise Engine & Machinery Co. He was recently regional manager, Superior Engine Div., National Supply Co.'s Springfield, Ohio, branch. He will serve Enterprise in the Illinois, Ohio, Indiana, Michigan, and Wisconsin area.

Ronald K. Evans has been elected an executive vice president of General Motors Corp. He has been vice president and group executive in charge of the general engine divisions, in which position he has been succeeded by **Cyrus R. Osborn,** vice president of GM and general manager of the Electro-Motive Div. **B. A. Dollens,** assistant general manager, succeeds Mr. Osborn as general manager of Electro-Motive Div. Mr. Dollens has also been elected a vice president of GM.

Gunner E. Gunderson has been named president, Brad Foote Gear Works, Chicago. Other officers elected were **E. J. Lindgren,** vice president, and **H. J. Buescher,** secretary-treasurer. Mr. Gunderson, formerly vice president, has been with the company since its inception in 1924, in charge of production.

Chester M. Adams has been named vice president in charge of production and research, Crobalt, Inc., Ann Arbor, Mich. Previously he was foundry superintendent for 14 years with Haynes Stellite Co., Kokomo, Ind.; general manager of Lescalloy Div., Latrobe Electric Steel Co.; and sales and application engineer with Kennametal Inc., Latrobe, Pa.

Hamilton Merrill has been elected president, Manning, Maxwell & Moore, Inc., Muskegon, Mich., succeeding the late **Robert Ross Wason. Chester H. Butterfield,** vice president, has been named in charge of the Consoldated-Ashcroft-Hancock Div., succeeding Mr. Merrill in that position.

Paul McKnight Deeley has been elected a director of Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Albert L. Gutterson has been elected president of Lovejoy Tool Co., Inc., Springfield, Vt. He was formerly associated with the Fellows Gear Shaper Co., and later with Jones & Lamson Machine Co. in the shop and engineering departments. He has also been associated with Gilbert & Barker Mfg. Co. of Springfield, Mass., as assistant chief engineer and later as sales engineer. For the past few years he has acted as manufacturers' agent in Vermont and New Hampshire for concerns making equipment used by the petroleum industry. **George A. Perry** has been elected a director, succeeding the late **Charles N. Safford.**

Edward W. Addis has joined the sales staff of Gordon & Kinney, Inc., Detroit representative for Automatic Transportation Co., Chicago. Previously he was with Rowe Methods, Inc., as sales manager.

Robert A. Brechter has joined Vandyck Churchill Co., New York, as sales engineer in the New Haven office, covering Fairfield and New Haven counties. He has spent the last year in training for his sales career at the plants of G. A. Gray Co., American Tool Works Co., and King Machine Tool Co., all of Cincinnati.

Ronald K. Evans

Cyrus R. Osborn

B. A. Dollens

Robert A. Brechter

George F. Brobyn has been named night superintendent of the main plant of SKF Industries, Inc., Philadelphia. **Emil Nagel** has been named assistant general foreman in charge of grinding and **K. J. Baird** has been named to the same position in charge of assembly, capping and packaging.

Ivan E. Howard has been named regional supervisor for the Clark Equipment Co.'s Industrial Truck Div. in the South Central territories, with headquarters in Peoria, Ill.

T. S. Bonnema, vice president in charge of production, Oster Mfg. Co., Cleveland, has been elected a director.

W. C. Snyder, Jr., vice president and manager of the Metallurgical Dept., Engineering & Construction Div., Koppers Co., Inc., Pittsburgh, has been named president of Freyn Engineering Co., Chicago, a Koppers subsidiary. He suceeds the late **Louis T. Shorley. Gordon Fox,** vice president of Freyn, has been named executive vice president and a director. Mr. Snyder will retain his Koppers position.

Philip Johnston has been named sales manager, Riehle Testing Machines Div., American Machine & Metals, Inc., East Moline, Ill. He succeeds **T. L. Richards.**

J. Paul Ahlbrandt has been named manager of product development, Clark Grave Vault Co., Columbus, Ohio. He was previously director of manufacturing, Hamilton Mfg. Co., and prior to 1947 was with Bendix Home Appliances, Inc., Midwest Mfg. Co., and Ingersoll Steel & Disc Div. of Borg-Warner Corp. One of his duties will be to supervise installation of a porcelain enameling department.

A. J. Grindle of Whiting Corp. Harvey, Ill., has been named consulting metallurgical engineer to succeed the late **A. W. Gregg.**

Gordon F. Seely has been named field engineer, Hydraulic Tool Div., Chicago Pneumatic Tool Co., New York. At present he is working out of the company's Detroit plant.

Lloyd C. Smith has been named vice president in charge of sales of Heller Brothers Co., with headquarters at Newark, N. J. He has been vice president and general manager of Heller Brothers at Newcomerstown, Ohio.

Raymond H. Cramer has been named general manager, Hyatt Bearing Div., General Motors Corp., at Harrison, N. J. He succeeds **H. O. K. Meister** who died June 10. In 1942 he was named factory manager, and has been in charge of Harrison and Clark Township (N. J.) manufacturing operations. Mr. Cramer has more than 40 patents in his name in connection with processing and manufacturing of roller bearings.

Thomas A. Farrell has been named president, Dearborn Motors Corp., Detroit, national marketing organization for the Ford Tractor and Dearborn farm equipment. He succeeds **Frank R. Pierce,** who died May 25. Other appointments: **Merritt D. Hill,** from general sales manager to vice president and director; **G. D. Andrews,** from assistant general sales manager to vice president in charge of sales; **Ralph E. Hunt,** from manager, Engineering & Mfg. Div., to vice president in charge of engineering and manufacturing; **I. R. Kappler,** from manager, Purchasing Div., to vice president in charge of purchasing.

Arthur P. Shanklin, vice president of Carrier Corp., Syracuse, N. Y., was elected president of Air Conditioning & Refrigerating Machinery Association.

Francis Aimers has been named factory manager, Highway Equipment Co., Inc., Cedar Rapids, Iowa. He had been general foreman there. Previously he was with LaPlant Choate Mfg. Co. of Cedar Rapids, John Deere, and Chamberlain Corp., Waterloo, Iowa. **Ed Sedlacek,** shop superintendent, has been named chief engineer.

R. R. Rolph has been named Detroit sales representative, Warner Gear Div., Borg-Warner Corp., Chicago. For many years he was vice president in charge of automotive sales for the Mechanics Universal Joint Div. of Borg-Warner. Since 1947 he has served as sales manager of Monroe (Mich.) Auto Equipment Co.

Robert M. Norton has been promoted from assistant sales manager to sales manager of Hanson-Van Winkle-Munning Co., Matawan, N. J.

Douglas A. Kuhna has been named chief engineer, J. N. Fauver Co., Inc., Detroit. He was with the Excello Corp. before the war.

Obituaries

Arthur H. Timmerman

Arthur H. Timmerman, 79, a vice president of Wagner Electric Corp., St. Louis, until his retirement in March, 1950, died July 18.

Richard C. Kinley, 71, whose retirement as vice president and works manager of National Acme Co., Cleveland, was reported in A.M., August 7, died August 10. He had been with National Acme 47 years.

Ardne W. LeFevre, vice president of Stewart-Warner Corp., Chicago, died July 21. He joined the firm in 1924, rising from draftsman-designer to engineering director, then head of sales to car factories and other standard equipment users of Stewart-Warner products.

Harvey H. Brown, Jr., 58, president of Cleveland Hobbing Machine Co., died August 12. He was a director of Eaton Mfg. Co., Enamel Products Co., Industrial Brownhoist, and Brush Beryllium Co.

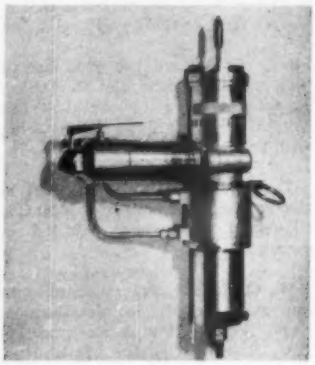
Charles N. Safford

Charles N. Safford, whose death was reported in *A. M.*, August 7. He was president and director of Lovejoy Tool Co., Springfield, Vt.

New Shop Equipment

Operator using ordinary power-driven countersinking tool has to apply thrust, method requires 3 1/2 min

Using the auto-sink tool, the operator needs only to lift it to position, method requires 30 to 40 sec



Tool body and air-motor housing are made of cast aluminum. Expanding mandrel is used to clamp tool

Countersinking Tool Saves 80% in Time

Invented by Boeing tool designers, and developed to its final stage by Boeing and Buckeye tool engineers, this tool does the countersinking of drill holes in Boeing bombers in 30 to 40 sec as opposed to the 3½ min formerly required. The operation is almost completely automatic in that no pushing effort is required on the part of the tool operator.

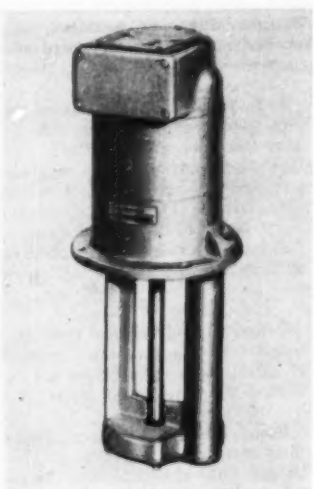
An automatically expanding mandrel at the extreme outer end of the tool is strong enough to hold the tool to the work sheet, in a vertical or horizontal position, without assistance from the operator. A dashpot and an adjustable countersink depth gage regulate the speed and depth to which the bit penetrates the metal.

Operation of the tool consists of placing the pilot mandrel in a drilled hole in the work sheet and by finger pressure opening the self-closing air supply valve on the handle of the tool. The air motor immediately starts rotating the countersink bit, and air pressure operating on a draw bar causes the pilot mandrel to expand on the opposite side of the work sheet. This is accomplished through a primary mandrel which undergoes a slight longitudinal movement in relation to the pilot mandrel, causing the latter to expand. An internal air cylinder then pulls the countersink bit against the work sheet at a selected rate and applies the necessary thrust to the rotating bit to countersink the hole.

The tool itself and the air-motor housings are made of aluminum-alloy castings for lightness. Although designed to meet the specific requirements of the aircraft industry, it is said the tool can be used to unusual advantage in any industry in which the countersinking of ⅜ in. or larger diameter holes is required.

Buckeye Tools Corp., Dayton, Ohio

(MORE DATA? CIRCLE FYI 33, p. 181)



Machine-Tool Coolant Pump Is Easily Mounted

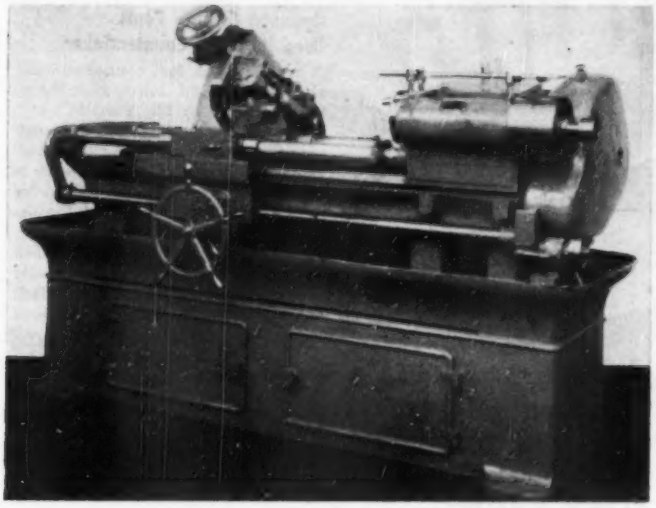
The impeller housing, spacer supports, mounting flange, and lower motor-end belt, consist of one casting in this Gusher machine-tool coolant pump. One of the spacer supports is cored to provide the discharge passage from the pump through the plate flange. This arrangement simplifies mounting in tank and machine bedplates, by the elimination of piping within the reservoir.

Driving motor is 1/10 hp., 3450 rpm, and is equipped with permanently lubricated ball bearings. The shaft is one piece, extending through the higher length of the unit. Rotating assembly is dynamically balanced by electronic process.

The Ruthman Machinery Co., Cincinnati 2, Ohio

(MORE DATA? CIRCLE FYI 34, p. 181)

Materials and Parts



Cornelis Thread Generator Eliminates Indexing

The principle employed in this Belgian machine differs considerably from the methods of thread-milling, lathe turning, or die chasing. The advantages are apparent when leadscrews or worms of multiple thread are to be cut, since no indexing is required. All starts of the thread are developed at the same time, eliminating the spacing inaccuracies sometimes caused by indexing from one thread to the other.

The thread-generating cutter, having the same helix angle as the thread to be cut, is driven by a bronze worm wheel meshing with a master worm or leadscrew. The cutter angularly moves on a saddle in the vertical plane, having the leadscrew acting as a trunnion producing its rotation. Changing the cutter, leadscrew, or worm-wheel diameter allows the machine to cut threads of any kind. Metric, inches, and modual leadscrews are supplied with the machine as standard equipment.

After the machine has been set up with the proper gearing, the rotary cutter is fed into the work to the required depth, using the 0.001 in. graduations on the hand wheel. When the machine is set for the proper depth of cut, the carriage feed is engaged and the cutter generates the thread as it advances along the work bar.

George Scherr Co. Inc., 200 Lafayette St., New York 12, N. Y.
(MORE DATA? CIRCLE FYI 35, p. 181)

Two Companies Produce Stainless-Steel Fire Extinguishers

American - LaFrance - Foamite and Walter Kidde have developed 2½-gal. portable fire extinguishers for water, soda and acid, and foam, made of stainless steel. Increased strength and pressure resistance, and decreased over-all weight are claimed for the extinguishers. They are tested to 500-psi pressure instead of 350 psi as before.

Nozzles of the portables are of clear plastic, so the operator can see at a glance if the discharge passage is clogged. Identification labels are permanently imprinted on the metal.

Walter Kidde & Co. Inc., Belleville 9, N. J.
(MORE DATA? CIRCLE FYI 36, p. 181)

American-LaFrance-Foamite Corp., Elmira, N. Y.
(MORE DATA? CIRCLE FYI 37, p. 181)

... INCLUDING

Surface grinder uses V-type slides; can finish-grind pieces up to 12-in. high.....page 174

Conveyor uses gravity and power to handle goods requiring varied processing periods.....page 175

Plastic and metal screw saves assembly time by combining properties of strength and insulation .....page 176

Briquetting press for converting scrap metal is available in five capacities .....page 178

Vise employs a quickslide action to contact work, then operates conventionally.....page 180

Non-ferrous metals in strip form are being preclad with a silver-brazing alloy .....page 188

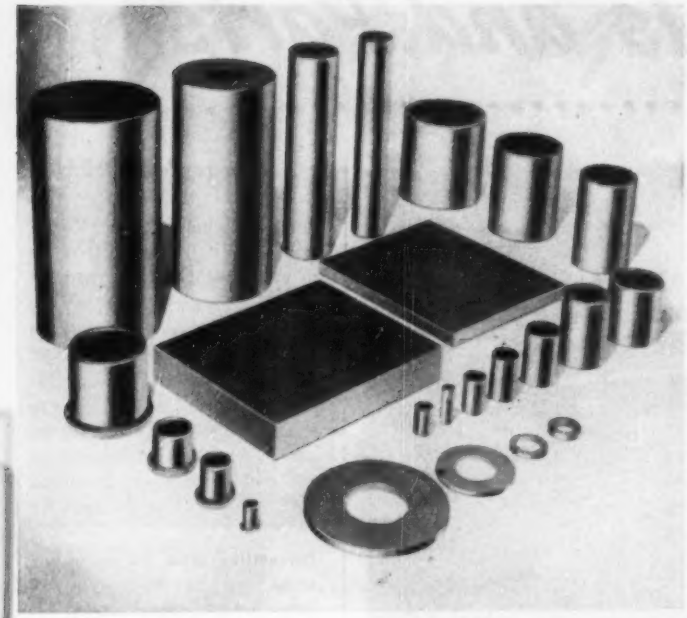
Chuck has the scroll located in the back of the unit, making it more accurate .....page 190

NEW BULLETINS for your Shop Library, including a 92-page catalog covering a line of metal fastenings.....pages 181 and 182

...and in September 18

Shears use a magnetic support to hold light-gage sheets level, so that they can be accurately aligned with back guide bar.

Hydraulic pump uses a vane construction to provide adjustable displacement.



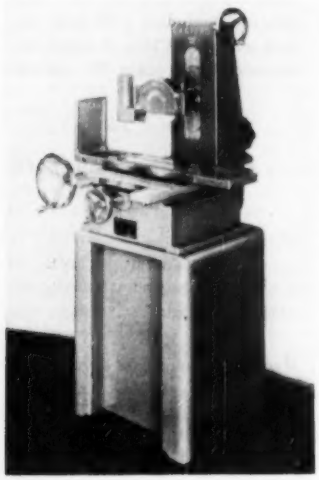
Boston Gear Offers Wide Range Of Oil-Impregnated Bearings

A porous-bronze line of bearings, cored bar, solid bar, and plate in a wide range of stock and sizes is being produced by Boston Gear. Because of their porosity the bearings carry their own oil reservoir, providing an oil film that is always present on every surface. The bearings are relubricated by applying oil to the outer surface. The oil is absorbed by capillary action.

Any reasonable press fit will assemble the bearings and they will not break or chip. The bore can be sized at assembly simply by using a shouldered arbor. Applied in standard, reamed holes and with standard shafts, no machinery is necessary for assembly.

Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

(MORE DATA? CIRCLE FYI 38, p. 181)



Surface Grinder Uses V-Type Slides

A block, die, part or unit up to 12 in. high may be finish-ground with a 7-in.-diameter wheel in this surface grinder. V-type slides, ground and lapped, are used instead of flat surfaces, and each surface is hand-tooled for positive lubrication and sensitive movement. Meehanite castings are used for strength and rigidity. Movements in inches are: traverse 8¾, longitudinal 13, and vertical 12.

Standard equipment includes: a 110-220 volt ac single-phase 60-cycle motor, wheel adapter, dust guards, exhaust guard, grinding wheel, and wrenches. It is checked to a grinding accuracy of 0.0002.

Sanford Mfg. Co., 1020-120 Commerce Ave., Union, N. J.

(MORE DATA? CIRCLE FYI 39, p. 181)

Opposed Cutting Tools Used in Black Countersinker

A machine for fast countersinking, chamfering, and burring is being manufactured by Black Drill Co.

The machine consists of a cast-iron base on which are mounted two motors with opposed cutting tools in collets, plus a toolpost and workholder located at the center of the assembly.

The tools are brought to the work by depressing a pedal which actuates both shafts simultaneously. Each shaft and the toolpost are equipped with micrometric adjustments for close control of cutting depth.

Motors from 1/3 to 1 hp. and 600 to 3600 rpm can be used, depending upon the size, cutting speed, and material to be machined. The maximum stroke limited by the motor-shaft travel is 2 in., permitting variation in the types and sizes of work that can be performed. Single motor units can be supplied.

Black Drill Co., 1400 E. 222nd St., Cleveland 17, Ohio

(MORE DATA? CIRCLE FYI 40, p. 181)

Automatic-Gripping Chuck Eliminates T-Wrenches

Known as the Auto-Grip chuck, this work-holding device eliminates the use of chuck bars and T-wrenches on all 2-in. pipe-threading machines which revolve the work.

The operator spins the handwheel of the chuck until the jaw strikes the pipe, then starts the machine. The chuck's jaws grip the pipe automatically. The tougher the pull, the tighter the grip. Six Oster machines are equipped with the chuck.

Oster Mfg. Co., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 41, p. 181)

1/6 TO 1/2 HP. MOTOR PROVIDES POWER, OPERATES ONLY WHEN PALLET IS ON POWER UNIT
GUIDE RAILS ENGAGE WHEEL, KEEP PALLET ON TRACK
CHAIN ENGAGES PALLET, PULLS IT FORWARD
WHEELS ROLL PALLET FROM LAST GRAVITY SECTION TO POWER UNIT
A END OF DOWNGRADE GRAVITY CARRIES PALLET ONTO CHAIN
B UPGRADE CHAIN PULLS PALLET UP FOR NEXT GRAVITY RUN
C START OF DOWNGRADE CHAIN RELEASES PALLET FOR GRAVITY RUN

Conveyor Handles Pallets With Gravity and Power

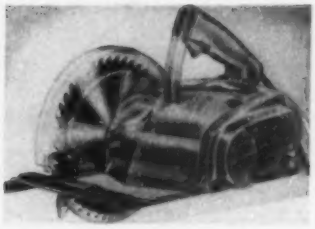
Called the Guided Pallet Conveyor, this equipment is designed for handling mixed goods requiring varied processing periods.

Palletized materials remain on the guided-pallet line throughout the production cycle, with flow to each work station regulated by individual worker. The power units index pallets forward and elevate materials to connected gravity sections, combining power with free flow from storage on the line. At work stations palletized goods may be raised, lowered, or rotated to most convenient working positions. Hinged sections in the line permit areas inside the loops of the conveyor to be used for storage or work space.

The gravity sections are manufactured in three standard widths and in 5 and 10 ft lengths. Power units, equipped with 1/6- to ½-hp motors, operate only while pallets are on the units. A pallet 72 x 30 in. in size has a load capacity of 200 lb with conveyor wheels on 6-in. casters, and 400 lb on 3-in. spaced wheels.

The Rapids-Standard Co. Inc., Dept. GP., 342 Rapistan Bldg., Grand Rapids 2, Mich.

(MORE DATA? CIRCLE FYI 42, p. 181)



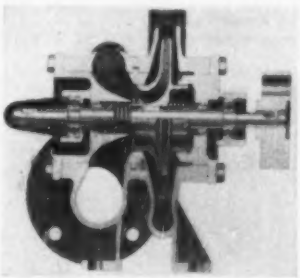
Dual V-Belts Drive Portable Electric Saws

Dual V-belts from the motor shaft to the saw arbor shaft drive this portable electric saw. Use of V-belts eliminates gears, gearbox, gear grease leakage and high gear-maintenance expense. In addition, the use of belts is said to cushion the motor from any sudden shock or overload.

The saw is constructed of metal stampings and develops up to 1½ hp. It is fitted with an 8½ in. blade and has a 2 11/16-in.-capacity cut.

Syntron Co., 511 Lexington Ave., Homer City, Pa.

(MORE DATA? CIRCLE FYI 44, p. 181)



DeLaval Pump Is Easily Maintained

The DeLaval GS pump is designed from the ground up to fit the idea of a service and exchange plan. All parts except the bare pump casing are contained in the rotor assembly. When maintenance is necessary, you simply remove the top cover and end plate studs, lift out the assembly and drop a new one in place. New and rebuilt rotors are available for immediate shipment from factory stock. Parts are available for pump users with maintenance shops.

The casing is horizontally split for easy access without breaking piping connections. To make the pump as maintenance-free as possible, mechanical seals have replaced the stuffing box and the bearings are prelubricated. The pump is built in three sizes for capacities to 450 gpm.

DeLaval Steam Turbine Co., Trenton 2, N. J.

(MORE DATA? CIRCLE FYI 45, p. 181)

Heat Is Adjusted Electrically In AC-Transformer Welder

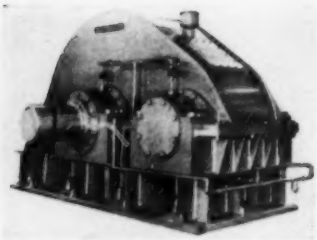
Heat adjustment is accomplished electrically through an ac-dc reactor in this ac-transformer welder. The transformer has conventional primary and secondary windings, plus an additional winding which supplies current through a rectifier to provide reactor adjustment.

Class-B insulation is used, with glass-covered conductors, and with glass cloth between layers. None of the coils move and all parts are anchored in place.

The ac winding of the reactor is in series with the transformer secondary and the arc, providing the reactance necessary to adjust the welding current. The dc winding takes current from the rectifier to saturate the iron of the reactor, providing fine adjustment of the welding current. The unit is available in 200, 300, 400, and 500 ampere sizes, with stationary or portable mountings. Attachments are available for all sizes to adapt these welders for inert-gas shielded or spot welding.

Hobart Bros. Co., Hobart Square, Troy, Ohio

(MORE DATA? CIRCLE FYI 43, p. 181)



Westinghouse Speed Reducers Use Double Helical Gears

Single and double reduction speed reducers known as the WSH and the WDH, have been developed by Westinghouse.

Gearing is of the standard AGMA hobbed double-helical type, with a high helix angle for smoother operation and less vibration at higher speeds. This type gearing is said to minimize thrust against either case walls or bearings, and assure uniform tooth loading and wear. Fabricated steel housings and BPT taper-hardened gearing and pinion shafts are used in both models.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.
(MORE DATA? CIRCLE FYI 46, p. 181)

Heavy-Duty Agitator Holds 50 Gal. of Solvent

A heavy-duty parts-cleaning unit called the Model 878 Agitor, holds 50 gal. of solvent, and will handle large stock.

A feature of the cleaner is a centrifugal pump powered by a ¼-hp motor with life-time grease-sealed ball bearings. A three-way valve system makes it possible to use the pump either to agitate cold safety solvents in the tanks, flush off stock directly, or regulate a steady stream of solvent where desired. It will clean dies, jigs, fixtures, and all machine parts which require individual handling. The price is $164.50.

Graymills Corp., Evanston, Ill.
(MORE DATA? CIRCLE FYI 47, p. 181)

Plastic-Metal Screw Saves Assembly Time

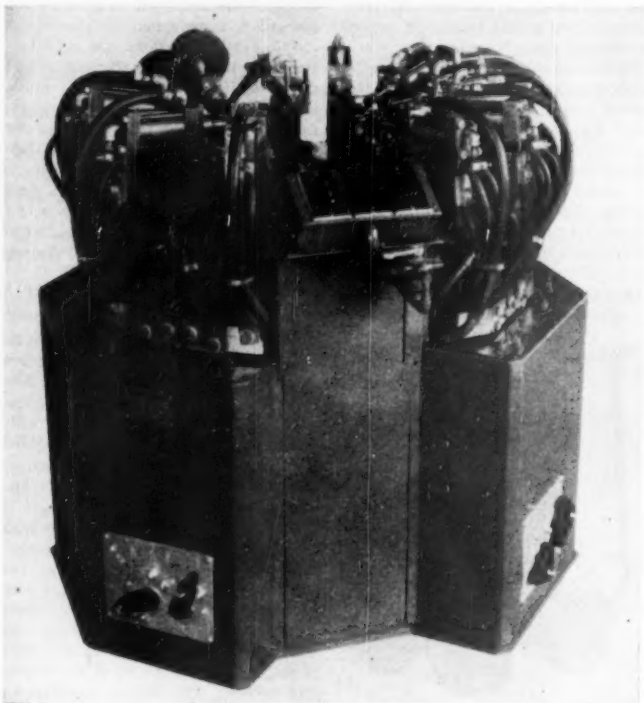
Called the Forman insulating screw, this fastener is said to be comparable in strength and accuracy to a standard metal screw, and yet to have the additional advantages of electrical insulation, shock resistance, and vibration damping. A product illustrating the assembly advantages of the insulating screw is an electrical relay, on which four of the fasteners replaced 18 parts.

The fastener consists of a serrated metal core which has been extrusion-coated with a thermoplastic material. The type of core and plastic used depends entirely on the use to which the screw will be put. After the extrusion process the composite rod is cut in a screw machine to form the threads and head. The metal core carries the torque applied by a screw driver or other driving instrument. There is said to be no danger of the plastic chipping or cracking under torque. The plastic

threads, when used with a metal nut, tend to seize and form an effective lock, thus eliminating the need for lock washers or lock nuts.

Standard sizes available from stock range in diameter from No. 8 to ½ in., with cellulose acetate insulation; from No. 10 to ⅜ in. with polyethylene; from No. 8 to ⅜ in. with cellulose acetate butyrate; and, from No. 8 to ½ in. with ethyl cellulose insulation. Lengths, head styles, type of thread, and color can be varied. Special sizes and types of plastic are available on special order.

Forman Insulating Screw Corp., 401 Broadway, New York 13, N. Y.
(MORE DATA? CIRCLE FYI 48, p. 181)



WELDER with 10 adjustable self-centering welding guns has five series transformers rated at 35 kva with 50% duty cycle. The operator places the parts to be welded and after depressing a control button, initiates the cycle which completes all ten welds in one operation. The machine welds better than 520 bases for household mixers per hour. By adjusting the locating fixtures and repositioning the welding guns, various size and shape bases can be handled.— *Sciaky Bros. Inc., 4915 W. 67th St., Chicago* (MORE DATA? CIRCLE FYI 49, p. 181)

CRANKSHAFT OIL HOLES FOR THE WORLD'S *Finest* CARS...

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ONLY a few ounces of metal removed per car, but the thousands of miles of oil holes drilled each year with Leland-Gifford Drilling Machines help keep America's cars and trucks running smoothly. Leland-Gifford *Step by Step* Hydraulic Feed Drilling Machines are preferred equipment for drilling oil holes in crankshafts and connecting rods for automobile and other engines . . . in fact for drilling all deep precision holes where accuracy of diameter, depth and placement is essential. If you drill holes more than four diameters deep, make sure you are drilling them with the greatest possible speed, accuracy, efficiency and economy. Investigate the Leland-Gifford *Step by Step* method. Write today for complete information.

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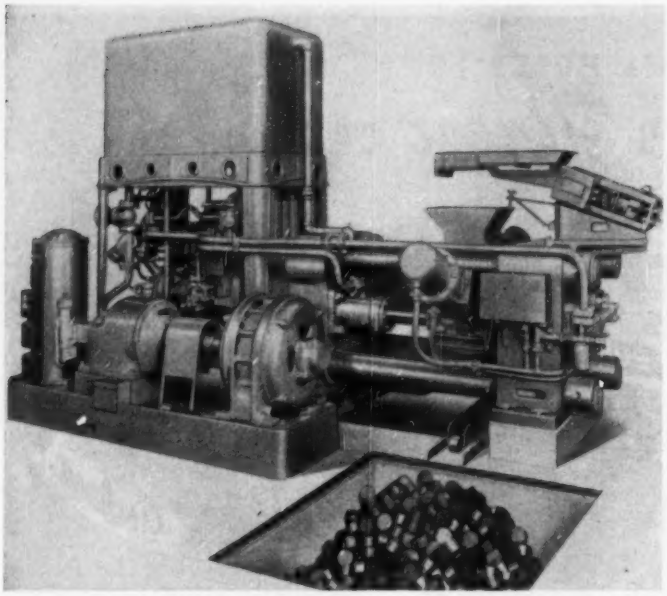


Milwaukee Briquetting Presses Available in 5 Sizes

Briquetting presses, manufactured by Milwaukee, convert low-grade bulk-metal turnings, borings, chips, and shavings into cylindrical metal blocks that are suitable for charging directly into a foundry cupola.

All operations are automatically controlled, either hydraulically or electrically. A pressurized lubrication system serves all moving parts, and the control systems are enclosed.

Chevron-shaped packing rings tighten as hydraulic pressure is applied.

Bulk scrap metals are placed in a hopper and then packed by air-powered tampers for subsequent squeeze operation. A hydraulically actuated ram then converts the scrap chips or turnings into cylindrical form.

Models No. 350, 275, 200, 100 and 75 have gray-iron briquette capacities of 3½, 2½, 2, 1¼, and ¾ tons per hour respectively. Production of briquettes from steel turnings varies with the weight and shape of material, per bulk cubic foot.

Spo Inc., 6430 Grand Division Ave., Cleveland 5, Ohio

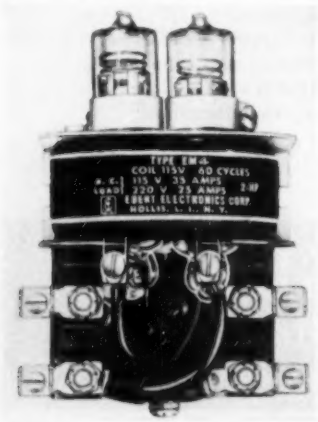
(MORE DATA? CIRCLE FYI 50, p. 181)

Tapered Jaw on Strap Cutter Makes Insertion Easy

The tapered lower jaw on this strap cutter can be inserted easily under the tightest strap. The offset handle affords a good grip with the tool lying flat against a surface. Only slight pressure on the top handle is required for cutting heavy-duty strap. The cutters are available in two models: one for 2 in., and the other for ¾- to 1¼-in. strapping.

A. J. Gerrard & Company, Melrose Park, Ill.

(MORE DATA? CIRCLE FYI 52, p. 181)



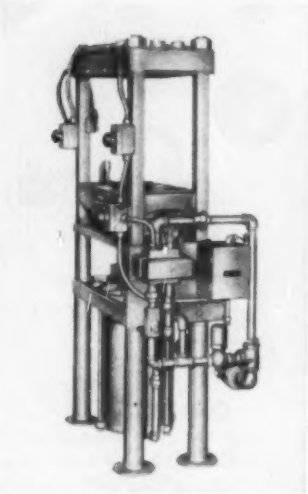
Two Poles Used in Mercury Plunger Relay

A design using two standard EMT tubes in one coil structure is said to be an efficient arrangement for loads up to 35-amp, 115-v ac or 25-amp, 220-v ac. Contact is made from mercury to mercury when the internal magnetic plunger is energized.

The relay lies in a hermetic dust-proof structure, based on heavy tungsten contacts in a hydrogen-filled glass tube. It is available with contacts normally open or normally closed. For special applications it can be obtained with one open and the other closed.

Ebert Electronics Corp., 185-09 Jamaica Ave., Hollis 7, L. I., N. Y.

(MORE DATA? CIRCLE FYI 51, p. 181)



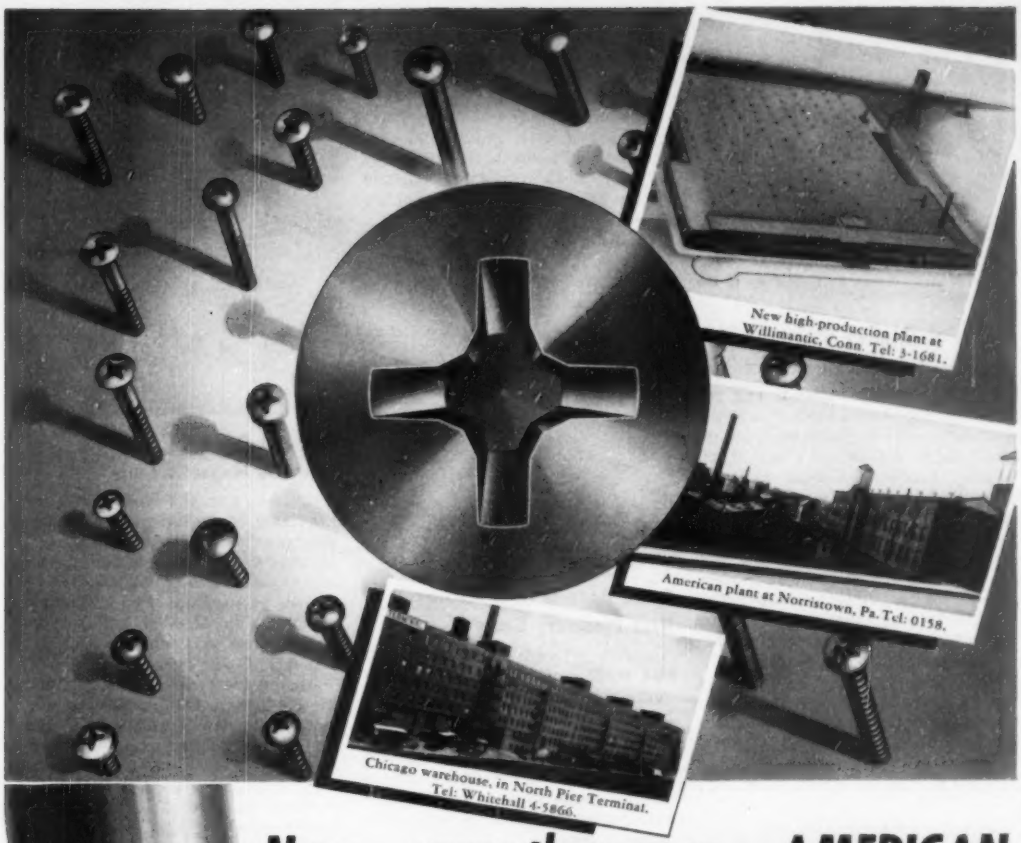
High-Speed Press Molds Alkyd Resins

Perfected after what is said to have been extensive research in the molding of plastic materials, this press is designed for Plaskon-alkyd resins. It is adjustable to a 2 sec speed, if required, with a controlled slow-down of the platen at closing.

Control is by dual pushbuttons connected to a ¾-in. electric valve. The press measures 14 x 21¾ in. between columns with 7-in. maximum stroke. Daylight: platen down, 17½ in.; platen up, 10½ in.

Hannifin Corp., 1118 So. Kilbourn Ave., Chicago 24, Ill.

(MORE DATA? CIRCLE FYI 53, p. 181)

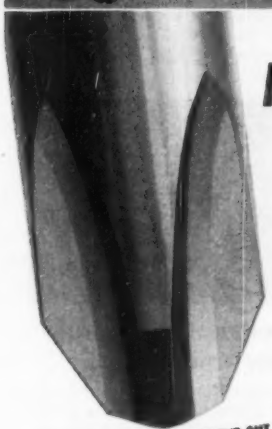

New high-production plant at Willimantic, Conn. Tel: 3-1681.
American plant at Norristown, Pa. Tel: 0158.
Chicago warehouse, in North Pier Terminal. Tel: Whitehall 4-5866.

Now...more than ever...AMERICAN is PHILLIPS HEADquarters

Yes, more than ever since American developed the Phillips Recessed Head and gave it to industry, American Phillips Screws of all types and metals are rolling out in larger quantity and higher quality.

5 acres of new machines and equipment, in the modern plant at Willimantic . . . plus the Norristown plant and Chicago warehouse . . . are keeping distributors and jobbers supplied to fill your orders *right now.* And that goes for all slotted fasteners, too.

Make a note of the *new phone number* of the new main plant... *Willimantic, Connecticut 3-1681* . . . also Chicago—Whitehall 4-5866, and Norristown 0158. Call the number nearest you, whenever you want action on large or small orders for Phillips or slotted.

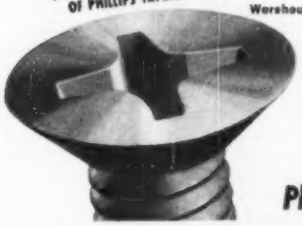


4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

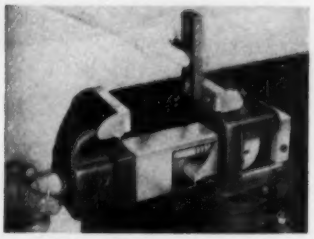
AMERICAN SCREW COMPANY

Plants at Willimantic, Conn., and Norristown, Pa.

Warehouses at: Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Bldg.



AMERICAN Phillips SCREWS Slotted



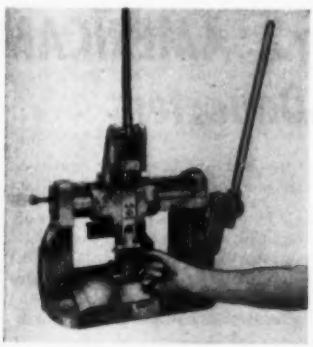
Neutral position of vise is shown in this cut-away view. It can be slipped up to the work shown.

Dodge Machinist's Vise Employs Quick Slide Action

This vise opens or closes to any position in one second through a push-pull action which eliminates spinning the handle. A turn and a half of the handle counter-clockwise and the jaw slides in neutral to any position. This is accomplished through the worm by raising a locking device from the ratchet. From the moment the work is engaged, the vise operates in the conventional manner. The handle bar is grooved to protect the operator against blood blisters between the thumb and forefinger.

The vise is provided with either a swivel or stationary base and is built in only the four-inch size. Weight is 58 lb.

Dodge Mfg. Corp., Mishawaka, Ind.
(MORE DATA? CIRCLE FYI 54, p. 181)



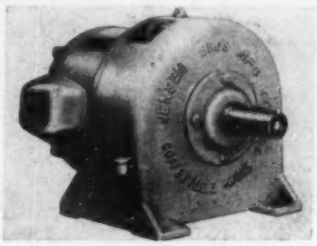
Counter-Wheel-Marking Machine Has Increased Accuracy

A redesigned fixture coupled with precision tooling is said to allow the Acromark Model 9A machine to mark metal and plastic counter wheels, meter wheels, and similar parts with greatly increased accuracy.

A die-closing cam allows stamping immediately adjacent to starter pins or cams on O.D. of a wheel blank. Machine can be arranged to use either hand, air, or electric power. Attachments for hot-stamping thermoplastic and most thermosetting materials can be furnished as interchangeable parts.

Standard models will take wheels up to 1½-in. O.D. and special construction will cover the range to 3½ in. The hand-operated machine weighs 200 lb., and is 16 in. long by 12 in. deep by 15 in. high.

Acromark Co., 382 Morrell St., Elizabeth 4, N.J.
(MORE DATA? CIRCLE FYI 55, p. 181)



Speed Reducer Uses Planetary Gears

A speed reducer, named the Geartork, consists of a system of planetary gears mounted in a cast semi-steel frame. The electric motor is bolted directly to this frame, the speed reducer and motor making a compact unit. Gears are machined and shaved and the main shaft is mounted on anti-friction bearings. Oil-bath lubrication is used.

The unit is available in a variety of sizes from ½ to 10 hp. The same sizes are available with double-reduction gear trains. Flange-mounted models have been developed for special applications.

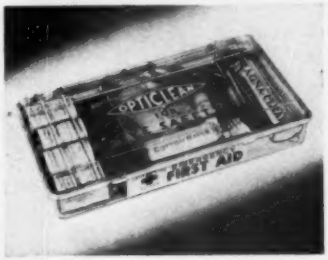
Jensen Brothers Mfg. Co., Coffeyville, Kansas
(MORE DATA? CIRCLE FYI 56, p. 181)

Steel-and-Rubber Grommet Stays Put

Steel and rubber grommets have curled prongs which are forced against the back surface of a blanked hole and provide a secure hold. They are formed of 0.034 to 0.036 cold-rolled steel and insulated with 1/32-in. Neoprene compound.

An expanding hand tool made available by the company is used to roll the curled prongs. A variety of sizes are available.

Automotive Rubber Co., Inc., 8601 Epworth Blvd., Detroit 4, Mich.
(MORE DATA? CIRCLE FYI 57, p. 181)



First-Aid Eye Kit Contains Magnetic Loop

Opti-Clean first-aid eye kits are for the hands of the firstaider who understands what not to do as well as what first aid he can give in eye-injury cases, and is not intended to replace professional service. The kit contains a smoothened, highly magnetized wire loop which makes the removal of loose metallic bodies safe.

Among the other items contained in the kit are eye pads, droppers, cups, cotton balls and swabs, and ointments. Refill materials are readily available. Price—$3.95.

Ohio First Aid & Pharmacal Co., Cleveland 13, Ohio
(MORE DATA? CIRCLE FYI 58, p. 181)

Keller Pneumatic Tool Dresses Electrodes Without Removal

The demand for a fast, easy-to-use tool for redressing round electrodes of single or multiple-point welding machine is said to have been answered by this Keller tool.

The cutter attachment of ¾-in. thickness accommodates close-clearance jobs. Both Porter and Severance type cutters can be interchanged. Fast cutting action is provided by a free speed of 1750 rpm.

Overall length of the Keller dresser is 12¾ in., net weight 4½ lb.

Keller Tool Co., Grand Haven, Mich.
(MORE DATA? CIRCLE FYI 59, p. 181)

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NEW BULLETINS

MACHINERY AND ATTACHMENTS

1 GRINDERS—*Mattison Machine Works, Rockford, Ill.* 8-page bulletin describes and illustrates 4 models of rotary surface grinders with from 1 to 3 vertical spindles. Specifications are included.

2 PUNCHERS—*Water-Strippit Corp., North Tonawanda, N. Y.* 4-page bulletin G contains specifications and description on hole-punching units for producing holes in ½-in.-thick mild steel. Illustrations show shop installations.

3 DRILL PRESS—*South Bend Lathe Works, South Bend, Ind.* 4-page bulletin 402 gives features of bench and floor type, 14-in. drill presses. Contains an order form, specifications, and a list of various accessories.

4 GRINDER ATTACHMENTS—*The Taft-Peirce Mfg. Co., Woonsocket, R.I.* 16-page booklet deals with attachments and accessories for Taft-Peirce and other surface grinders. Includes such items as grinding fixtures, chucks, and wheel dressers.

TOOLS AND ACCESSORIES

5 CHUCKS—*O. S. Walker Co., Inc., Worcester, Mass.* 24-page catalog illustrates and describes rotary, rectangular, surveying, and vacuum magnetic chucks. Contains some general information on the theory of magnetic chucks.

6 ABRASIVE WHEELS—*Charles H. Besly and Co., Chicago 6, Ill.* 50-page pocket catalog describes the design and application of the company's abrasive wheels and disks. Tables of peripheral speeds at various rpm are included.

7 CIRCULAR SAWING—*The Meath & Merryweather Machinery Co., Cleveland 11, Ohio.* 24-page handbook contains tables on the proper selection of saw blades, and the speeds, feeds, and tooth angles for sawing various materials.

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66 67 68 69 70 71 72 73 74 75 76 77 78
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8 TOOLHEADS—*Chandler Tool Co., Muncie, Ind.* 8-page leaflet covers a line of combined boring and facing toolheads. Specifications and prices are included.

9 DIESETS — *Union Mfg. Co., New Britain, Conn.* 4-page folder gives specifications for and illustrates a line of combined cast diesets.

10 GREASES—*Gulf Oil Co., New York 30, N. Y.* 48-page non-technical booklet on lubricating greases and their application. One section discusses the jobs greases can do best and tells how greases are made for particular jobs.

PLANT SERVICE EQUIPMENT

11 PUMPS—*Eastern Industries Inc., New Haven, Conn.* 12-page booklet contains construction details and specifications on a line of industrial pumps. Performance charts are included.

12 TRANSFORMERS—*The Superior Electric Co., Bristol, Conn.* 16-page bulletin P550 includes performance graphs, descriptions, and a rating table on variable transformers.

13 FILTERS—*Micro Metallic Corp., Brooklyn, N. Y.* 8-page booklet on the advantages, easy operation, and manufacturing methods of SIMS filters. Property and capacity tables are included.

14 FLOOR PATCHING—*The Master Builders Co., Cleveland 3, Ohio.* 8-page bulletin tells of an iron-asphalt patching material for concrete floors that is said to take impact without chattering and to make leather wheels wear easy.

15 ROTARY PUMP—*DeLaval Steam Turbine Co., Trenton 2, N. J.* 6-page bulletin describes a general-service screw-type rotary pump for petroleum products. Tables of Viscosities and NEMA motor frame sizes are included.

16 TIMING MOTORS—*Haydon Mfg. Co., Inc., Torrington, Conn.* 8-page brochure examines data on six models of timing motors.

PARTS AND MATERIALS

17 FASTENINGS—*Atlas Screw and Specialty Co., New York 11, N. Y.* 92-page catalog lists a complete line of bolts, screws, nuts and washers, U and J-bolts, and other products.

18 STAINLESS VALVES—*Cooper Alloy Foundry Co., Hillside 5, N. J.* 48-page catalog describes stainless-steel valves, fittings, and accessories. Contains a materials reference chart and corrosion data.

19 PAINTGRIP STEEL—*Armco Steel Corp., Middletown, Ohio.* 12-page booklet outlines approved methods for fabricating and finishing a bonderized sheet metal.

20 ALUMINUM BRONZE — *Ampco Metal Inc., Milwaukee 46, Wis.* 16-page bulletin 106 covers the machining questions to be employed in the machining of Ampco magnesium-bronze alloys. Another section covers the machining of Ampco-Trode weld deposits.

21 VARIABLE-SPEED DRIVES — —*Link-Belt Co., Chicago 1, Ill.* 68-page booklet 2274 illustrates, lists, and describes 8 sizes and 16 types of variable-speed drives.

22 BAR STOCK—*Hunt Spiller Mfg. Corp., S. Boston 27, Mass.* Lists and gives the specifications and prices on cored and solid bar stock.

23 MOTORS—*The Electric Products Co., Cleveland 11, Ohio.* 16-page pamphlet illustrates and describes a line of custom-built electrical equipment including motors, generators, and battery chargers.

24 CAPACITORS — *Aerovox Corp., New Bedford, Mass.* 40-page catalog lists and describes a line of capacitors, resistors, vibrators, and test instruments.

MISCELLANEOUS

25 PAINTS — *U. S. Stoneware Co., Akron 9, Ohio.* 12-page brochure tells where and how to use a corrosion-resistant paint known as Tygon. Includes a corrosion-resistance table.

26 RUBBER FILMS—*Natural Rubber Bureau, Washington 5, D. C.* 40-page booklet "Rubber Developments" published by the British Rubber Development Board tells of a rubber-latex film used as a temporary protective coating for metal parts.

27 PHOTO - ELECTRIC — *Detroit Testing Laboratories Inc., Chicago 18, Ill.* 8-page catalog describes a line of photoelectric equipment for applications such as counting and production control.

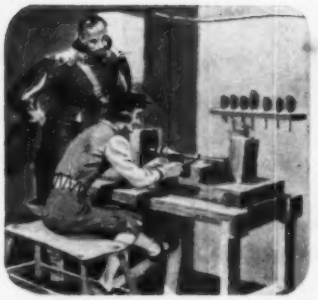
28 FABRICATION — *Stewart Warner Corp., Chicago 14, Ill.* 20-page brochure is devoted to the company's South Wind div. It shows the division's facilities for the fabrication of parts and assemblies for industry.

29 ROLLER CHAINS—*Morse Chain Co., Detroit 8, Mich.* 4-page catalog insert gives the details on a packaging program for roller chains and parts.

30 STRAINERS — *American District Steam Co., North Tonawanda, N. Y.* 16-page catalog on strainers and separators. Contains descriptions, dimensions, weights, and list prices of line.

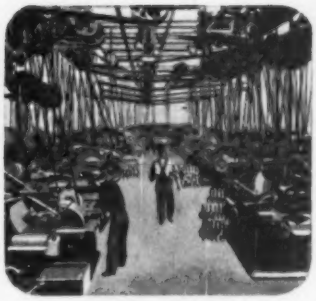
31 FILING SYSTEMS — *Remington Rand Inc., New York 10, N. Y.* 40-page booklet is concerned with "How to Simplify Your Files and Filing Systems." It charts the file cycle of a file, and points out the features of a good system.

32 PHOSPHATE COATINGS—*Amercoat Chemical Paint Co., Ambler, Pa.* 12-page bulletin gives information on a line of phosphate-coating chemicals for paint bonding, rust proofing and other uses.



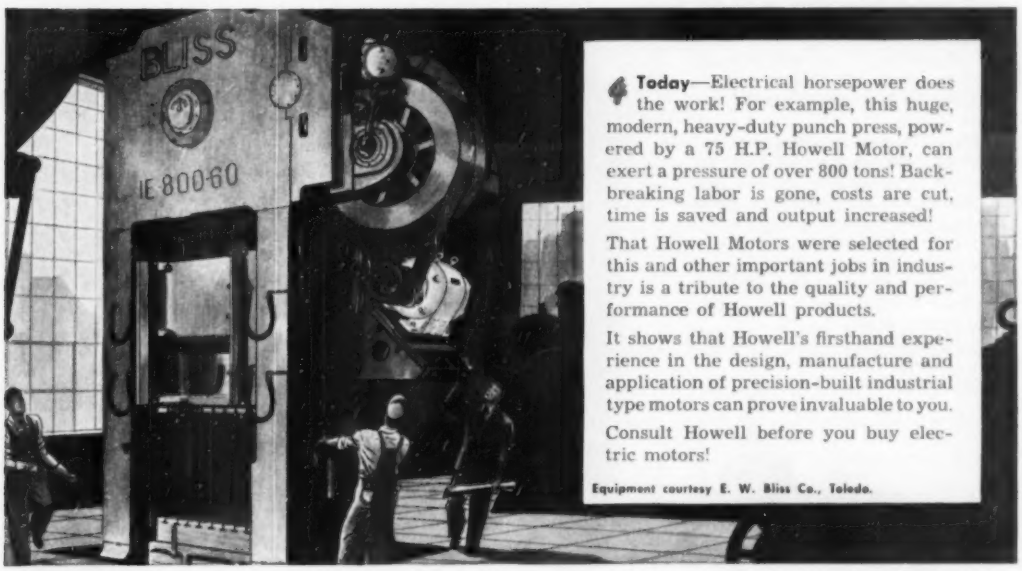
1 1600—Man worked hard for his pay in these days. Crude machines like this began to lighten his load by replacing laborious handwork with foot power. But progress was really only beginning.

2 1875—By accident, it was discovered that if two direct current dynamos were connected together, one would serve as a generator and drive the other as a motor. Electrical horsepower was here!



3 1900—Result: Electrical horsepower replaced foot power! By 1915, Howell "Red Band" Electric Motors arrived. Soon, these rugged, industrial type motors were widely accepted in many industries.

NOW...A PUNCH PRESS WITH A PUNCH!



4 Today—Electrical horsepower does the work! For example, this huge, modern, heavy-duty punch press, powered by a 75 H.P. Howell Motor, can exert a pressure of over 800 tons! Back-breaking labor is gone, costs are cut, time is saved and output increased!

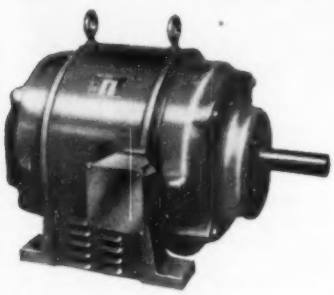
That Howell Motors were selected for this and other important jobs in industry is a tribute to the quality and performance of Howell products.

It shows that Howell's firsthand experience in the design, manufacture and application of precision-built industrial type motors can prove invaluable to you.

Consult Howell before you buy electric motors!

Equipment courtesy E. W. Bliss Co., Toledo.

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.



Howell Type F Punch Press Motor

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

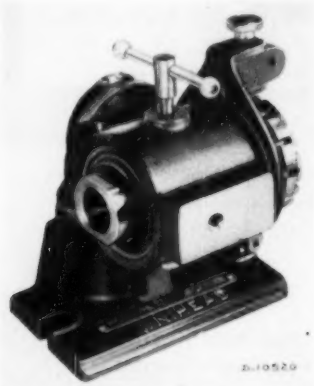
Portable Magnetic-Inspection Unit Has Wide Applications

A portable, general-purpose magnetic inspection unit is expected to find wide application for maintenance, safety, and general inspection. Called the Magnaflux, it is said to make readily visible all defects such as fatigue cracks, shrink cracks and weld cracks.

The unit contains outlets for either ac or dc. Ac magnetization is best for location of all surface defects such as service fatigue cracks in tools or shafts. The half-wave rectified dc has been developed for location of sub-surface defects such as internal cracks in welds, and for cracks on the inner surface of cylindrical parts. The price is $485.

Magnaflux Corp., 5900 Northwest Ave., Chicago 31, Ill.

(MORE DATA? CIRCLE FYI 66, p. 181)



Delta Workhead Provides Greater Flexibility

A universally adjustable workhead, built by Delta, is said to provide greater flexibility in grinding keyway cutters, angular cutters, end and spiral mills, and other cutters.

The head consists of a heat-treated sleeve arranged with a No. 9 Brown & Sharpe taper and mounted in preloaded, sealed, life-lubricated ball bearings. Adjustable-index and dog can be disengaged or set in any position convenient to the operator. A 12-tooth index collar with selector plate permits the dog to engage either 2, 3, 4, 6, or 12 selected equal spaces. Nut at back of sleeve pushes out tight-fitting adapters, without damaging them.

The workhead can be used on other grinder makes by employing a Delta stop-tooth unit.

Delta Power Tool Div., Rockwell Mfg. Co., 600 Vienna Ave., Milwaukee 1, Wis.

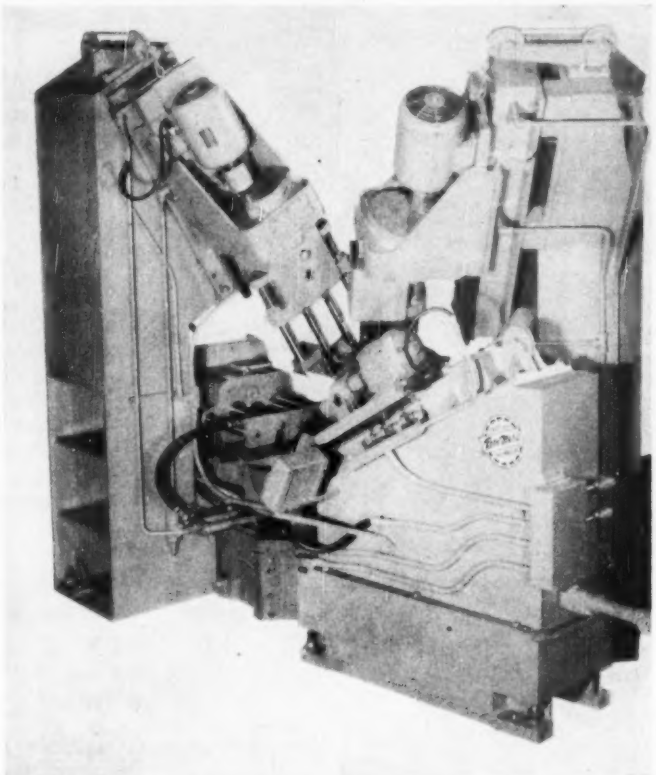
(MORE DATA? CIRCLE FYI 67, p. 181)

Ball-Bearing Flange Unit Designed for Light Loads

Designed to meet the requirements of small-shaft equipment where light loads and normal speeds are imposed, this flange has internal self-aligning ball bearings. A labyrinth-type seal eliminates drag and wear.

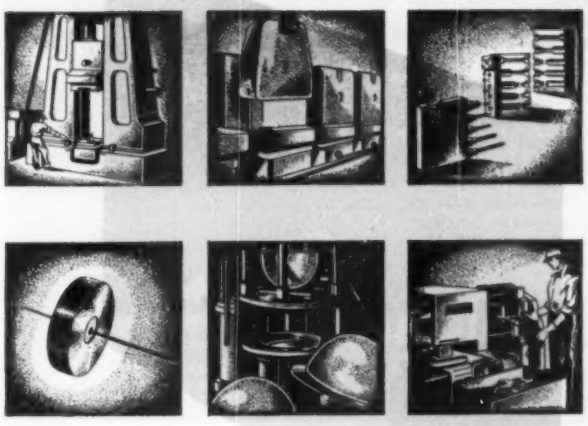
Ahlberg Bearing Co., 3025 W. 47th St., Chicago 32, Ill.

(MORE DATA? CIRCLE FYI 68, p. 181)



Plow-FROG DRILLER has four power heads, each having independent hydraulic feed and spindle speed-change gears. Clamping of the work piece is accomplished through the use of a single hydraulic clamping fixture. A mechanical locking device safeguards against unclamping because of hydraulic failure. The machine makes possible the drilling of 12 holes varying in diameter from 13/32 to 21/32 in. at the rate of 120 pieces per hour.—*Davis and Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.*

(MORE DATA? CIRCLE FYI 69, p. 181)



FREE NEW Bulletin will help you in Lubricating Hot Metal Operations

AT 400°F., and up as far as you ever go, **"dag"** colloidal graphite provides the best and most dependable lubrication.

In deep piercing you get smooth forgings, close tolerances, and reduce wear on dies. In casting and mold stripping you get smooth surfaces, clean parting, fewer rejects; and additional mold life.

In forging you minimize scaling and sticking, improve finish, lengthen die life.

In stretch-forming you reduce tearing and rippling. In wire-drawing you get perfect diameter, smoother finish and greatly extended die life.

Brass, bronze, aluminum, magnesium, carbon steel and stainless steel . . . wherever your fabrication problems are friction and heat . . . **"dag"** colloidal graphite reduces the one and resists the other.

The NEW Acheson Bulletin #426 on the Use of **"dag"** Colloidal Graphite in Metal-forming Operations is just off the press . . . a copy is ready for you if you will fill in and mail the coupon.

Acheson Colloids is equipped to do custom disintegrating, dispersing, and stabilizing of solids in a wide variety of vehicles. If you are in need of this type of service, tell us about it. We may be able to help you.

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Port Huron, Michigan

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dag DISPERSIONS

Acheson Colloids Corporation, Port Huron, Michigan
. . . also Acheson Colloids Limited, London, England

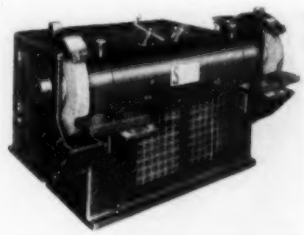
Flame-Hardened Casters Are Said To Be Practically Indestructible

Rapistan 500 Series casters are designed for heavy-duty service on racks, dollies, and portable equipment in many industries.

A hardening process called Rapid-Flame employs precisely controlled intense heat, plus a water quench, to form a surface that resists shock and impact. Toughness and ductility of the forging is not affected by this localized hardening process.

500 Series casters are equipped with 2½-in.-wide wheels, with diameters of 4, 6, 8, or 10 in. in either swivel or rigid types. Models are available with micro-steel, Durastan plastic, molded-on rubber, or V-trac wheels. Top plate size is 5¼ x 7¼ in., with bolt-hole spacing of 3⅝ x 5¼ in.

Rapids-Standard Co. Inc., 542 Rapistan Bldg., Grand Rapids 2, Mich.
(MORE DATA? CIRCLE FYI 70, p. 181)

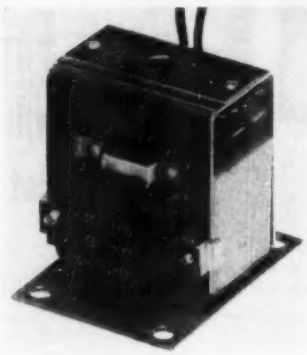


Grinder Has Speed Adjustment To Compensate for Worn Wheels

Twin-motor double-end grinder has a crank handle which simultaneously adjusts the guard and increases the spindle speed in direct relation to the amount of wear on the wheel. This means of constantly changing the speed allows a speed of exactly 9500 sfpm to be maintained throughout the entire life of the wheel.

The grinder is a 2-in-1 machine in that each station is entirely independent of the other. The spindle assembly is mounted in heavy-duty ball bearings, fully protected, with large-size oil reservoirs and visual oil gage. The emery-wheel guards are of structural plate steel with a stationary exhaust outlet. Adjustable workrests are 7x7 in.

Standard Electrical Tool Co., 2480 River Rd., Cincinnati 4, Ohio
(MORE DATA? CIRCLE FYI 71, p. 181)



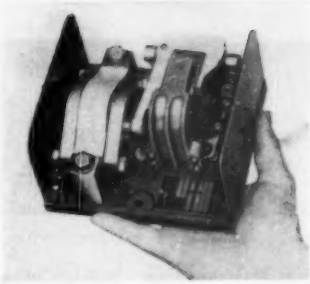
Long-Life GE Solenoid Uses a Cast-Permafil Coil

A short-stroke solenoid said to be the result of years of research and development has been announced by General Electric. Basic component of the device is a paper-layer-wound coil, a type that holds the voltage between turns to a minimum and greatly reduces the possibility of failure due to reduced voltage between layers of turns.

Foot-long leads are firmly anchored and taped, and the coil is placed into a mold into which liquid permafil is poured. After the permafil hardens, the coil assembly is baked. This results in a solid protective block around the coil that is moisture-, oil-, shock-, and vibration-resistant. A T-magnet and a dual-pole shader for quiet operation are other features. A stainless-steel backstop assembly with an oil- and water-resistant neoprene pad fastened to it absorbs the shock of the return stroke.

A push-type solenoid, it has a maximum stroke that does not exceed 5/16 in. Available in four models, including strokes from ⅛ in. and 5/16 in., and two stacking thicknesses.

General Electric, Schenectady 5, N. Y.
(MORE DATA? CIRCLE FYI 72, p. 181)

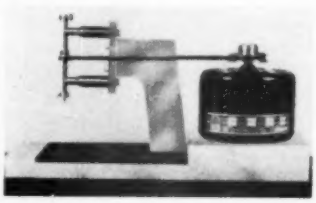


Magnetic Air Valve Uses Rotary-Action Principle

The rotary-action design of this magnet-operated air valve is said to permit high capacity and fast operation in a small size. Overall dimensions of the valve are 4-in. wide, 6½-in. high, and 5¾-in. deep.

It is designed as a four-way, four-port, ⅜-in. valve, for control of a double-acting air cylinder. Valve cross-sectional area is greater than that of a ⅜-in. standard pipe, and pressures up to 100 psi can be handled. It will operate continuously at 300 cycles per min., and at speeds up to 600 cycles per min. on intermittent duty. Direct-acting magnet and the low inertia of the rotary motion is said to make this fast operation possible. The magnet coil requirement is 38 v-amp at 60 cycles and 215 v-amp inrush.

Square D Co., 4041 N. Richards St., Milwaukee 12, Wis.
(MORE DATA? CIRCLE FYI 73, p. 181)

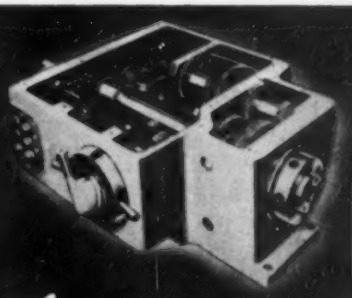


Walcon Micro Drilling Machine Has One Moving Part

The only moving part in this micro drilling machine is the spindle. It runs in bronze oilless bearings of the V-type and is held in place and in alignment by an endless rubber-drive belt. Any wear that develops between the spindle and the bearing is automatically taken up by the pull of the belt. This same pulling force is said to reduce drill-point breakage. The machine is manufactured by Walcon Engineering Co.

Dudley Cohen, Walcon Distributor, 116 West 72nd St., New York 23, N.Y.
(MORE DATA? CIRCLE FYI 74, p. 181)

It's the hidden values that determine Sidney's low cost production



CHECK THESE SIDNEY LATHE CONSTRUCTION FEATURES

The all herringbone geared headstock provides a smooth flow of power to the spindle—eliminates harmful backlash and is distinctly a Sidney development that is paying dividends in precision work over long periods.

The totally enclosed gear box, with all gears running in oil, offers additional advantages in convenience of feed and thread changes.

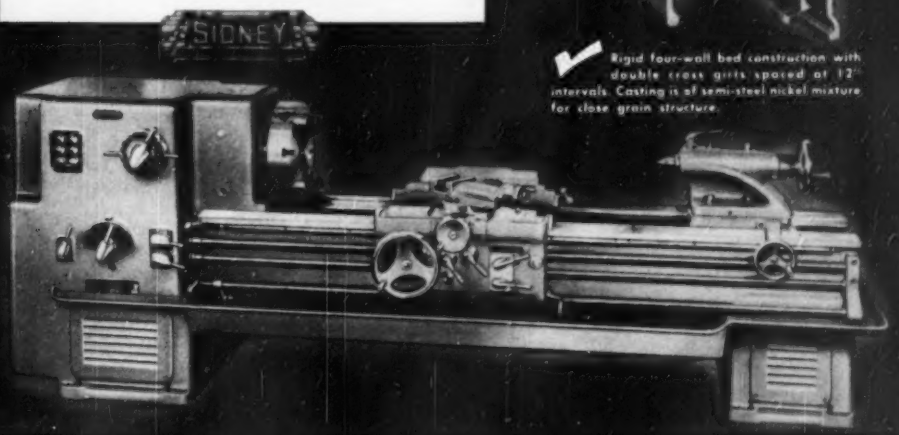
The rigidity of four-wall bed construction is reflected in the continued accuracy of the work.

All of which adds up to precision production, year after year at costs that are consistently low. The hundreds of satisfied Sidney users are evidence of Sidney economy and Sidney ability to meet your turning problems.

✔ All herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.

✔ Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

✔ Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.



SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

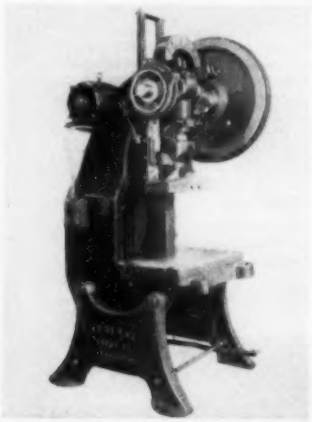
Builders of Precision Machinery Since 1904

Hanson-Whitney Thread Gage Checks 20 Pieces Per Minute

This gage visually indicates whether threads are oversize, undersize, eccentric, tapered, or if load error exists. Capacity covers external threads from No. 0 to 3⅛-in. diameter, coarse or fine pitches in all classes. The gage is said to be capable of checking up to 20 pieces per minute.

The upper anvil is positioned in relation to the lower anvil (actually a split internal-thread member) by insertion of a setting plug and tightening of indicator lockscrew. The indicator is equipped with tolerance hands and is graduated in tenths of thousands to 0.0002 accuracy.

Hanson Whitney Co., Hartford, Conn.
(MORE DATA? CIRCLE FYI 75, p. 181)

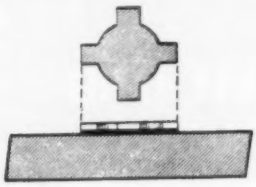


Federal 35-Ton Press Handles Wide Range of Job

Federal Press has developed a 35-ton capacity model, known as No. 44, which has an extra-long stroke, shut height and throat depth. The No. 44 has a nominal stroke of 6 in. and a standard shut height of 10 in. However, presses are available that have any stroke from 1 to 12 in., or a frame extension or added shut height from 1 to 10 in. over standard. Throat depth is 11½ in.

Features of the unit include a removable ball seat, round-type ram clamp, and a reclining mechanism.

Federal Press Co., Elkhart, Ind.
(MORE DATA? CIRCLE FYI 76, p. 181)



Irregular shaped joint made from Braze-Clad brass eliminates special blanking of silver brazing alloy.

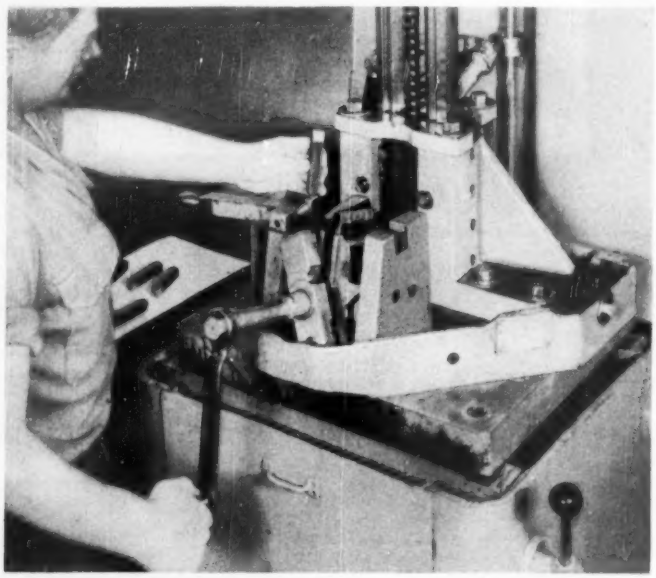
Non-Ferrous Metals are Pre-Clad With Silver Brazing Alloy

A development known as Braze-Clad, consists of laminating a layer of silver brazing alloy to one or both sides of non-ferrous metals in strip form. In this process the silver brazing alloy is diffused into the parent metal at the suppliers' plant and can be of any specified thickness and in any commercial melting range. Precladding is said to eliminate the necessity of using rings, washers, preformed special shapes, and other forms of silver brazing alloys currently used in metal joining. Since the entire joint surface of the parent metal is prediffused with silver brazing alloy, voids caused by dry spots and oxide islands are eliminated. Longer and more uniform joints are said to be possible than when face feeding is employed.

The preclad metals can be blanked, stamped and drawn in the usual manner. Multiple joining as performed by induction heating or furnace brazing can be accomplished by placing the part to be joined in the proper position, fluxing and heating in the usual manner.

Typical applications of Braze-Clad metals include hollow handles for cutlery and silverware, cap-on-rod joints, hidden joints, seamed tubes, and the joining of irregularly shaped parts such as springs and contact arms.

Rolled Plate Div., American Silver Co. Inc., Flushing, N. Y.
(MORE DATA? CIRCLE FYI 77, p. 181)



SURFACE BROACHING accurately tapers both sides of from 6 to 15 hand-stamp blanks per cutting stroke of this machine. The two broaches are attached to the ram of a 10-ton, 36-in.-stroke press by means of a crosshead and T-slot arrangement. The broach tower is of split construction and mounted on ways so that the two halves may be laterally adjusted by means of screw-operated wedges.—*Colonial Broach Co., Detroit, Mich.* (MORE DATA? CIRCLE FYI 78, p. 181)

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the complete mastery of any art or craft or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the progress and total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, obscured, or even lost in the conflicting claims of others who would seek the personal worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement now used the world around was originally conceived, developed, and invented solely and entirely by . . . Hjalmar Ellstrom.

Here, briefly, is the story of his accomplishment: During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

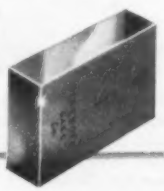
Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom.

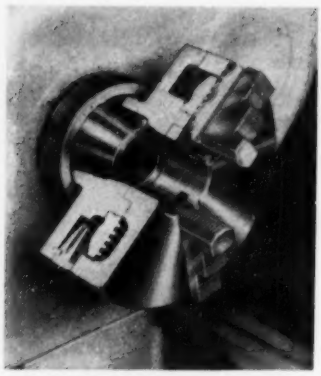
ELLSTROM . . . *measuring in millionths for three generations*

DEARBORN GAGE COMPANY

22035 BEECH STREET • DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks





Scroll Bearing-Surface Change Improves Accuracy of Chuck

A Universal scroll chuck has the scroll located in the back of the chuck, the bearing ring representing a continuation of the spindle. This is in contrast with conventional lathe chucks in which the scroll rotates about a bearing ring located in the front half of the chuck, while the spindle bearing surface is located in the back of the chuck. This location at the rear, apart from the scroll bearing ring, is said to have resulted in basic inaccuracies, which are accumulatively magnified in other parts of the chucks. In the new unit the scroll hub is integral with the chuck back and is machined on exactly the same type spindle on which the chuck will be used, and is, therefore, said to be inherently concentric with the spindle.

A finer-pitch scroll in the new chuck provides 30% more holding pressure through greater surface contacts. Longer, thicker, and 12% wider jaws add to the strength of the chuck.

The units are available in sizes 6, 8, 10, and 12 in., to fit various spindle noses.

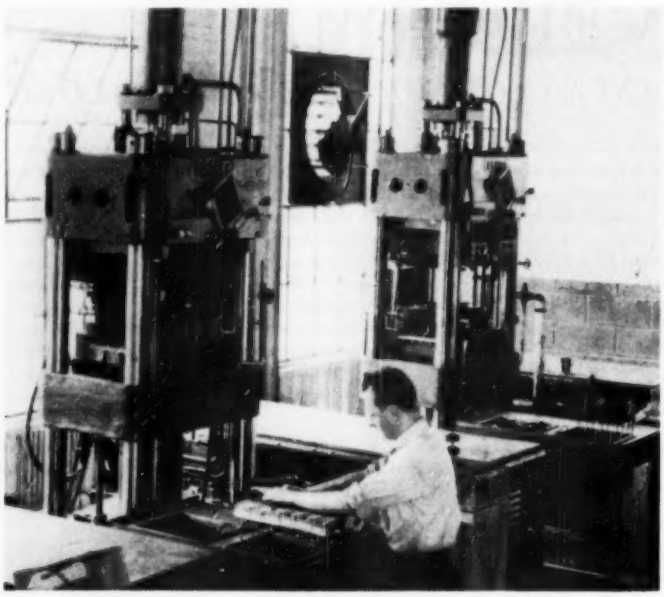
Union Mfg. Co., Church St., New Britain, Conn.

(MORE DATA? CIRCLE FYI 79, p. 181)

Internal pipe wrenches are available in a broader range of sizes including ⅛, 2½, 3, and 4-in. sizes. They are particularly suited for installation or extraction of fittings in close quarters where conventional wrenches cannot be used, and where the exterior of the pipe cannot be marred or scratched.

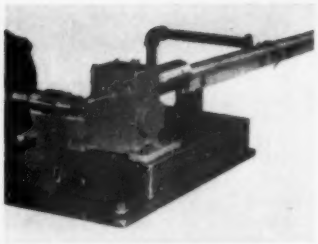
Roddick Tool Co., 112 Rochester St., Costa Mesa, Calif.

(MORE DATA? CIRCLE FYI 80, p. 181)



MOLDING PRESS for plastics has a 35-ton transfer ram, is pushbutton controlled, and has an automatic time cycle. Controls are tied in with high-frequency heating units. Size is 150 tons. The company also produces a 50-ton press that takes its power from a shop airline.—*Elmes Engineering Div., American Steel Foundries, 11 Tennessee Ave., Cincinnati 29, Ohio*

(MORE DATA? CIRCLE FYI 81, p. 181)



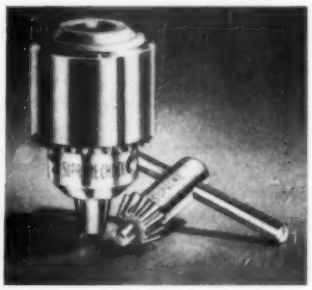
Overhead and Bench Conveyor Makes Closed Circuit Unnecessary

Teleflex conveyor consists of two principal components: a flexible cable and a metal rail. The cable provides a spiral thread on its exterior; the results being comparable to a flexible screw of any desired length. The helix or thread of the cable extends above the rail section and the cable is revolved within the rail. The items to be transported by the conveyor are suspended from hooks carried on the rail and propelled along it by the screw action of the revolving cable.

A ½-hp drive unit is generally recommended to attain a maximum speed of 12 fpm. It will carry light loads up to 15 lb per ft around bends and through rise or fall. The fact that a closed circuit is unnecessary is said to provide a simple, low-cost unit.

Teleflex Inc., P.O. Box 4408, Nicetown, Philadelphia 40, Pa.

(MORE DATA? CIRCLE FYI 82, p. 181)

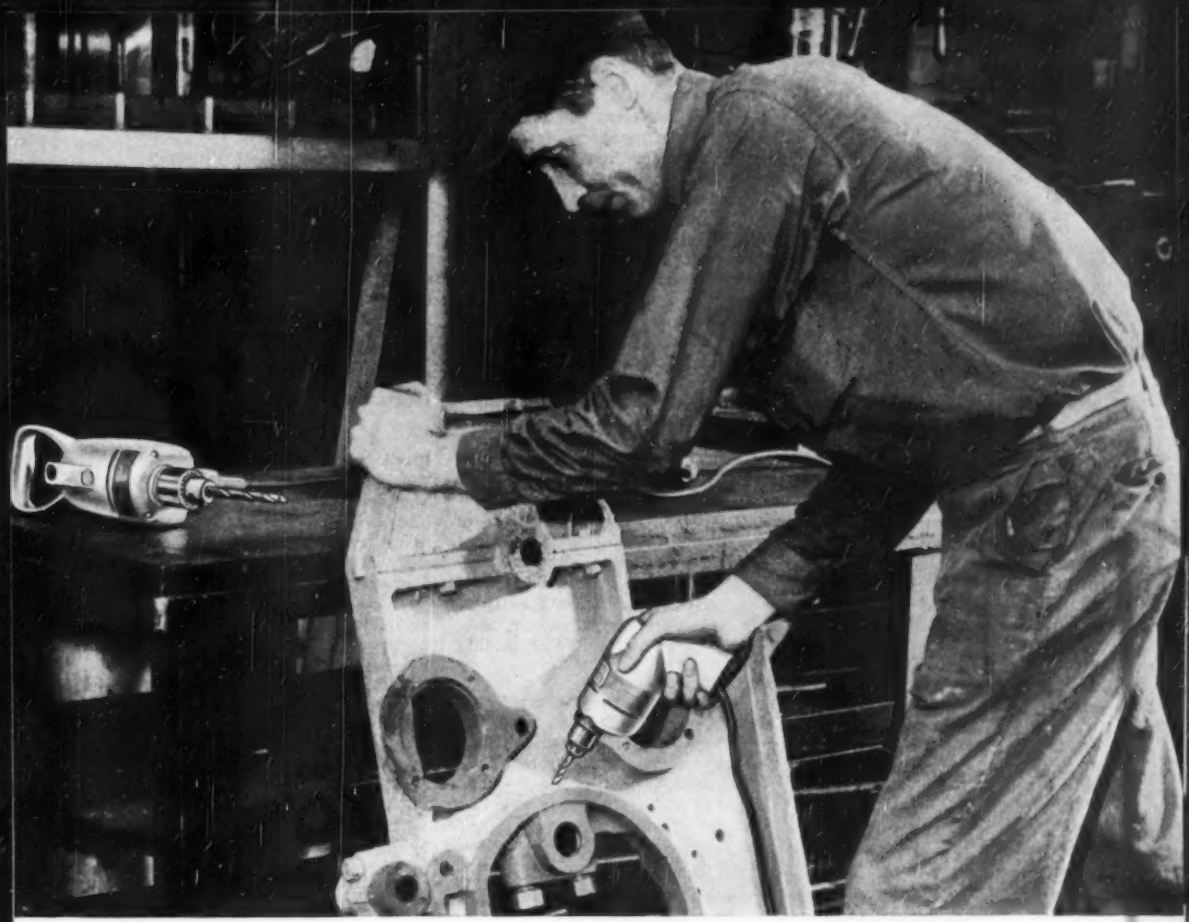


Gear and Threaded Nut In Key Chuck Are One Piece

The manufacturer of this key chuck claims that slippage between the outer shell and threaded nut is eliminated by one-piece construction. The key tightens and releases jaws without spindle rotation. Parts are of wear-resistant alloy steels, heat-treated for durability, and precision ground.

Supreme Products Inc., Chicago, Ill.

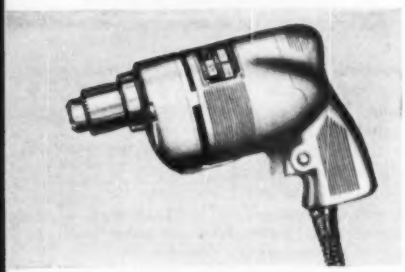
(MORE DATA? CIRCLE FYI 83, p. 181)



Difficult angle drilling on end castings for GASMACO's Automatic Time Cycle Control is made easy with a Model 45 SKIL Drill. (Model 80—½ inch Drill on bench.)

at GASMACO,* difficult angle drilling gets done faster and better with SKIL DRILLS

Where shop efficiency requires the tool to come to the work, GASMACO does production jobs with portable SKIL Drills. In GASMACO's Cleveland plant, production workers prefer SKIL Drills for their light weight, easy handling; for their fast action in tough, heavy materials. In industrial plants everywhere, SKIL Drills stand up longer, need fewer repairs. It will pay you to standardize on SKIL Drills. Ask your SKIL Distributor about them today.



MODEL 45 SKIL DRILL

Powerful, compact ¼ inch Drill. Easy to handle—only 6⅝ inches long, weighs only 2½ lbs. Ask your SKIL Distributor to show you this Model 45 SKIL Drill.

*GAS MACHINERY COMPANY
Cleveland, Ohio

SKIL
PORTABLE TOOLS

SKIL Products are made only by
SKILSAW, INC.
5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada: SKILTOOLS, LTD.
66 Portland St., Toronto, Ont.

Automatic Drill-Press Feed Frees Operator's Hands

Pneumatic feed installed on the spindle of a drill press, permits controlled-power operation. A three-way valve permits manual, semi-automatic, or automatic operation. The adjustable return-spring action, found in all standard drill presses furnishes the power for the return stroke. Use of a pedal valve frees the operator's hands for handling work.

Model 100 fits small bench presses up to 15-in. capacity, develops 4 times line pressure, accommodates up to 1 13/16-in.-diameter spindles. Model 200 fits 17- and 18-in. presses, develops 9 times line pressure, accommodates up to 2½-in.-diameter spindles.

Modernair Corp., 4222 Hollis St., Oakland 8, Calif.
(MORE DATA? CIRCLE FYI 84, p. 181)

Insulating and splicing tape based on Bakelite polyethylene resins welds into a continuous elastic skin within a few minutes after wrapping. It is claimed to be almost impossible to unwrap or delaminate, and to be unaffected by corrosive fumes, ozone, sunlight and oxygen. Both clear and black forms of the tape are produced.

Bishop Mfg. Corp., 854 W. 31st St., New York 1, N.Y.
(MORE DATA? CIRCLE FYI 85, p. 181)

Spline gages of the plug and ring type can be adjusted like snap gages for different fits, engineering changes, and wear. For high production they deal with the problems of wear and engineering specification changes. They are also said to possess flexibility to cope with such problems as determination of accumulation of errors, heat treat distortion, backlash determination for pilot runs and initial tooling.—*MP Tool and Engineering Co., 2339 Caniff Ave., Detroit 12, Mich.*
(MORE DATA? CIRCLE FYI 86, p. 181)

Air dryer for compressed air lines combines the functions of an aftercooler and a mechanical dryer in a single unit. Incoming air first passes downward between inner and outer shells, trapping out entrained moisture or oil, and then passes upward through a Fiberglas baffle the full length of the cartridge in order to reach the outlet valve. The drying component is encased in a water jacket which cools the incoming air and greatly increases the condensation of the water vapor into moisture that can be removed mechanically.

The Gasflux Co., Mansfield, Ohio
(MORE DATA? CIRCLE FYI 87, p. 181)

Materials handling box is made of corrugated steel, and has heavy-duty casters. Units are of all-welded construction, the box reinforced by steel channels. Crane lugs are optional.

Palmer-Shile Co., Detroit 27, Mich.
(MORE DATA? CIRCLE FYI 88, p. 181)

Handtruck has a heavy pressed-steel nose that is ribbed for strength. Angle shape of the nose permits it to be triple-welded to the frame. Built of channel beams welded together, the handtruck is claimed to be lighter than most.

Standard Pressed Steel Co., Jenkintown, Pa.
(MORE DATA? CIRCLE FYI 89, p. 181)

Drill-jig bushings are being made from an oil-hardened steel called Colonial No. 3 which is said to give many times the wear resistance of steels formerly used. The steel is said to provide greater uniformity in heat-treating, eliminating some of the grinding required in processing ordinary tool steels. Hardness of the bushings is maintained at from 62 to 64 Rockwell C.

Colonial Bushings, Inc., Detroit, Mich.
(MORE DATA? CIRCLE FYI 90, p. 181)

Dock board for both truck and freight-car loading has vertical, horizontal, and lateral movement. It has ranges of 24-in. vertically, 14- to 24-in. horizontally, and 4 in. of lateral movement. The main motive power is developed from two full hydraulic cylinders, one for vertical and one for horizontal movement. The lateral movement is supplied by a flexible-channel ramp construction.

Beacon Experimental & Engineering Co., 714 North 13 St., St. Louis 3, Miss.
(MORE DATA? CIRCLE FYI 91, p. 181)

Socket set screws and cap screws in smaller sizes have been added to a line of Bristol multiple-spline socket-screw products. They are designed for use in small assemblies for equipment such as cameras, scientific instruments, electronic equipment, and clocks. The multiple-spline socket screws are made as small as No. 2 wire size, and the cap screws are made in diameters to No. O wire size.

Bristol Co., Mill Supply Division, Waterbury 20, Conn.
(MORE DATA? CIRCLE FYI 92, p. 181)

Plastic pipe known as Carlon Ex has burst pressures up to 260 psi. The pipe has the advantages of flexibility, light weight, and resistance to rot, rust, and electrolytic corrosion. A 100-ft section of the 2-in.-diameter pipe weighs 61 lb. Dielectric strength is 500 volts per mil. It is available in 2, 2½, 3, 4, and 6-in.-diameter sizes.

Carter Products Corp., 10267 Meech Ave., Cleveland 5, Ohio
(MORE DATA? CIRCLE FYI 93, p. 181)

Metal marking stamps are being produced in a set of 36 stamps containing 31 fractional figures, separated by 32nds, and the whole numbers 1, 2, and 3, as well as a dash and an inches sign. The stamps in these sets are made of high-grade tool steel, blued for rust prevention, and with striking heads that are tempered to prevent chipping or mushrooming.

Acme Marking Equipment Co., 8030 Lyndon, Detroit 21, Mich.
(MORE DATA? CIRCLE FYI 94, p. 181)

Induction heat-treating of non-ferrous metal strip is being accomplished by a transverse-flux method. Magnetic flux is directed perpendicular to the surface and through the strip instead of along its length, as in conventional radio-frequency induction heating. This increase of cross-section intercepting the magnetic flux increases the power factor. The heating is accomplished by passing strip between two opposed laminated pole structures. The field coils, supplied with alternating current, are oppositely polarized so that flux is forced through the strip. Frequencies of from 60 to 10,000 cycles per second are used with this system, depending on the thickness of the strip and its resistivity.

Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30, Pa.
(MORE DATA? CIRCLE FYI 95, p. 181)

SWISS PRECISION CRAFTSMANSHIP SWISS DEPENDABILITY ACCURACY

UNDER THE HAUSER ROOF is the greatest selection of SWISS precision machine tools available from any one source in the United States.

HAUSER

Jig Borers—Six types ranging in table size from 4" x 4" to 20" x 29½"

Jig Grinders—Two types, table sizes 14¼" x 9½" and 12¾" x 22"

Optical Measuring Machines—Profile and Workshop microscopes with magnification up to 100 X

Profile Projector—Magnification up to 100 X, screen size 18½" x 22"

Hardness Testers—Test range, 1 Kg. to 200 Kg.

Pivot Polishing Machines—Six types ranging in work diameters from .002" to 1"

SAFAG

Automatic Wheel & Pinion Cutting Machines—Four types ranging in work diameters from .012" to 3.93"

Automatic Form Cutter Milling Machines—Work diameters, .02" to 2"

Automatic Cutter Backing Off Machines—Work diameters, .25" to 1.58"

AGATHON

Various Types of High Precision Die Sets—Maximum space between columns, 14"

SCHAUBLIN

Toolmakers Lathes, Turret Lathes, Repetition Lathes, Lead Screw Lathes—Six different types with swings from 5⅛" to 9-7/16"

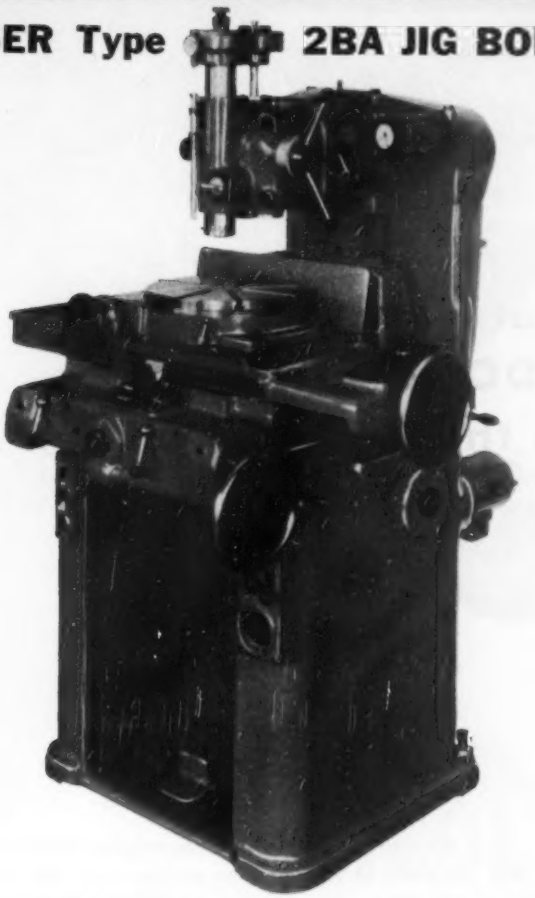
Milling Machines—Five different types, working surface of table ranging from 4-23/32" x 16½" to 10" x 43-5/16". Inclination of spindle—All angles in all directions

Sensitive Drilling & Tapping Machines—Five types, capacities from ⅛" to 5/32"

Automatic Drilling & Tapping Machines

Spring Collets—Any form and dimension—U.S. Standards

HAUSER Type 2BA JIG BORER



Combining the highest degree of precision obtainable in any machine of similar capacity with ease of set-up and operation, this superb Swiss Jig Borer is typical of the six famous Swiss lines now available to American industry through Hauser Machine Tool Corp.

Bores to 2½" diameter—Drills to 23/32" Guaranteed placement of slides, .0001"

Stepless Drive—80 to 3000 rpm Automatic control and compensating features

Many precision accessories provide unmatched flexibility

WRITE FOR COMPLETE LITERATURE

TORNOS

Swiss Automatic Screw Machines—Various types ranging in capacity from 5/32" to 1-3/16"

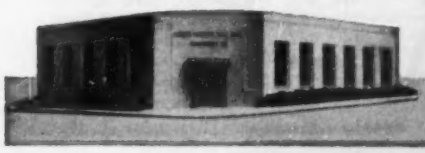
Cam Making Machinery

LAMBERT

Semi-Automatic Gear Generating Machines—Three types ranging in capacity from ⅛" to 8" in diameter

Automatic Thread Cutting Machines—Capacities from .012" to 5/16" in diameter

Factory Service and Replacement Parts Available at All Times



HAUSER

MACHINE TOOL CORP.

MANHASSET · NEW YORK

HAUSER-NEW YORK

What is done is DONE... on the GOSS & DeLEEUW

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ROUND TABLE Discussion

ARE PROMISES MADE TO BE BROKEN?

It is undesirable to exact from any man, when he is engaged, the promise that he will regard the job as permanent. Let him be a free lance for a while, until both he and his boss are thoroughly satisfied. If both, after say a month, are still that way, then is the time to talk about a permanent job, if business conditions are still good, with the promises to stay if employed. Most any machinist, if he really wants the job, at that moment will promise most anything to get it. On the other hand, the majority of foremen will often make promises to the man if he will stay that they couldn't, in most cases, carry out even if the man proved to be highly satisfactory in every way. Of course, where a promise is made it should be honored. But there are so many unknown circumstances at the time of the interview that it is unfair and undesirable to promise anything at all.

You can generally keep the average good man on the job, if he wants to stay with you, by seeing that he is getting in wages what he is worth, that his working conditions are as good as possible, that you talk with him occasionally, and make quite sure that he thoroughly understands any instructions you give him, particularly with regard to the work he is doing. This is exceptionally important in the first couple of weeks, because he badly wants to make good, so don't overlook anything at all where he might slip up. See that all the tools, fixtures, gages, and anything else he will have to use are available, and furthermore you see that he gets them. Introduce him to the fellow workers in the immediate vicinity. If the job needs a helper, give him the best one available. That is important too. A good helper has played a vital part many times on getting a new man settled in a new job. He will learn more about the plant in a couple of days from a good helper than in a month if on his own. This is not pampering, it is necessary.

If you give him a job that is regular production, and the operations are laid out in sequence by the planning department, try and draw him out. Ask him if he knows of a better way that might save time and money. Often a new man has worked

*UNIFORMITY

Under all conditions, Tycol cutting oils more than meet the exacting requirements of the metal-working industry.

Rigidly controlled and tested during manufacture, Tycol cutting fluids retain their *UNIFORMITY — from the first drum to the last.

This unvarying high quality, plus the scope of the line, accounts for Tycol's wide acceptance among operators interested in finer finishes . . . freer, faster cutting . . . longer tool life.

Whatever your cutting need, let a Tide Water Associated engineer help you select the best fluid for your particular purpose. Call, write or wire your nearest Tide Water Associated office for full details.

TYCOL
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TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

*LEARN WHAT THIS PRODUCT CHARACTERISTIC MEANS TO YOU — READ "LUBRICANIA"
This informative handbook, "Tide Water Associated Lubricania," gives clear, concise descriptions of the basic tests used to determine important properties of oils and greases. For your free copy, write to Tide Water Associated Oil Company, 17 Battery Place, New York 4, N. Y.

REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL

in a plant and done work similar to what he is now doing, but using better methods and possibly different equipment than he now has to use which could be introduced in Ed's department to the great advantage of both man and employer.

Arthur Silvester
Niantic, Conn.

•

RAT'S NEST

THE PROBLEM of housekeeping is one that plagues shops, large and small. A shop that is clean and neat makes a marked impression on personnel as well as visitors. Such tidiness usually results in progress and improved production but sometimes it does not. There are many old timers whose workmanship is superb but whose housekeeping leaves much to be desired. These men do not pay particular attention to their dress or the manner in which tools and scrap stock are strewn about their benches. When these craftmen served their apprenticeship, cluttered workbenches and good deportment were given no consideration. Because these men have worked in so many shops of this cluttered caliber for so long, they pay no attention to this question; for to them it is but a minor detail. When the subject of personal appearance or cluttered workbenches is broached, these men stubbornly refuse to change their ways. The oldtimers resent the apparent charge they are sloppy (though inwardly they probably realize they are) and after a lecture

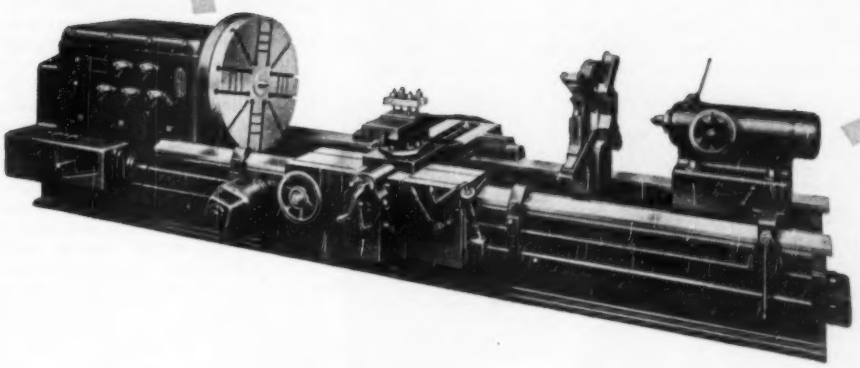
"This is the 18th time this month! What are they doing — retiring the whole factory?"

Announcing

the

NEW NILES

Heavy-Duty Engine Lathe



Here's a new line of Niles heavy-duty engine lathes – improved in many important respects over the older famous Niles lathes. There are more antifriction bearings. Beds are heavier. Automatic lubrication is more extensive. All 56 feeds and threads are instantly available without changing quadrant gearing.

Range of sizes is from 40″ to 80″, and up.

All models have the extra margin of power, strength and rigidity which have made Niles machine tools so well known for maintained accuracy under heavy-duty operating conditions.

• •

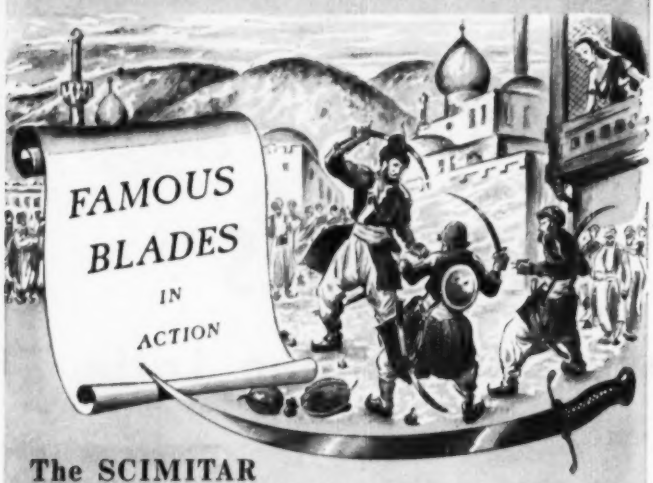
Full information on these new lathes can be obtained through Lima-Hamilton offices in New York, Chicago and other principal cities or by writing directly to Lima-Hamilton Corp., N. 3rd Street, Hamilton, Ohio.

LIMA HAMILTON CORPORATION

NILES TOOL WORKS CO. **HAMILTON, OHIO**

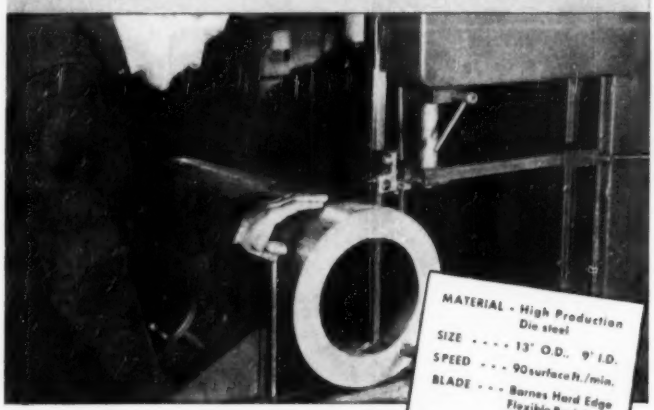
A division of the Lima-Hamilton Corporation

BARNES METAL CUTTING SAWS



The SCIMITAR

As practical as it was picturesque—the graceful curve of this blade added to its strength and made it a convenient weapon to carry or use—on a horse or afoot. The Scimitar's keenness and strength are largely attributed, however, to the uniform high quality of Damascus steel.


MATERIAL - High Production Die steel
SIZE - - - - 13" O.D., 9" I.D.
SPEED - - - 90 surface ft./min.
BLADE - - - Barnes Hard Edge Flexible Back Band Saw - 1" - 10 Tooth

This Customer Says:

"Barnes Dependability is uniform high quality repeated in every Barnes Blade!"

A prominent tool steel supplier—using Barnes blades exclusively in warehouses from coast to coast—chose Barnes Saws because blade after blade cuts straight, keeps its set long—gives dependable, economical service.

See YOUR Industrial Distributor

He stocks Barnes Famous Blades and he can help you with your metal cutting problems.

BARNES Established 1919

W. O. BARNES CO., INC.

1297 TERMINAL AVE. • DETROIT 14, MICH.

they sometimes stall around to prove that deportment and appearance lectures are not only unimportant but actually detrimental. These men are in many instances excellent craftsmen and management hesitates to censure them too severly though they be untidy.

Young craftsmen, new to the business, are not trained for the most part in the type of apprenticeship the oldtimers were. The young men do not realize that out of some of the old-fashioned clutter there actually was a degree of order. These new men feel that clutter in the shop merely is a company sanction to untidiness in thinking and work, the result being that efficiency and production as well as morale drop. The men are far more suspectible to the annexation of sloppy habits due to sloppy surroundings than were the older men.

Personnel should be lectured on tidiness in the shop from time to time. Personal follow-up lectures should be given privately to individuals who lag, but should one of the oldtimers feel insulted and balk I suggest the following procedure: Let the foreman soften his censure to the older worker but not withdraw it altogether, at the same time pressing harder on the young men and newcomers. The new workers usually react to the prodding and then our sloppy though skillful friend will find himself sticking out like a sore thumb in his untidiness. In nine cases out of ten for shame's sake and at the none-too-gentle joking of his fellow workers our man will succumb and at least clean up his surroundings if not dust off his mental processes. This system has worked so far in every instance it has been applied.

In the matter of scrap accumulation, some discretion should be used. In model shops and toolrooms a collection of odd pieces on each man's bench can be an asset. It saves much valuable time for the model or toolmaker to refer to his small stock for a knock-out rod, a spacing block, or the makings of an inexpensive fixture. Such a collection should be a supplement to the usual odd-piece storage bins, should be neatly sorted and not strewn all over the bench until it leaves no room for the work as is so often the case.

In the production, second-operation, and manufacturing departments there is an entirely different situation. With the exception of a small supply for the set-up men there should be no superfluous stock around. Such stock is truly junk and serves no other purpose than to

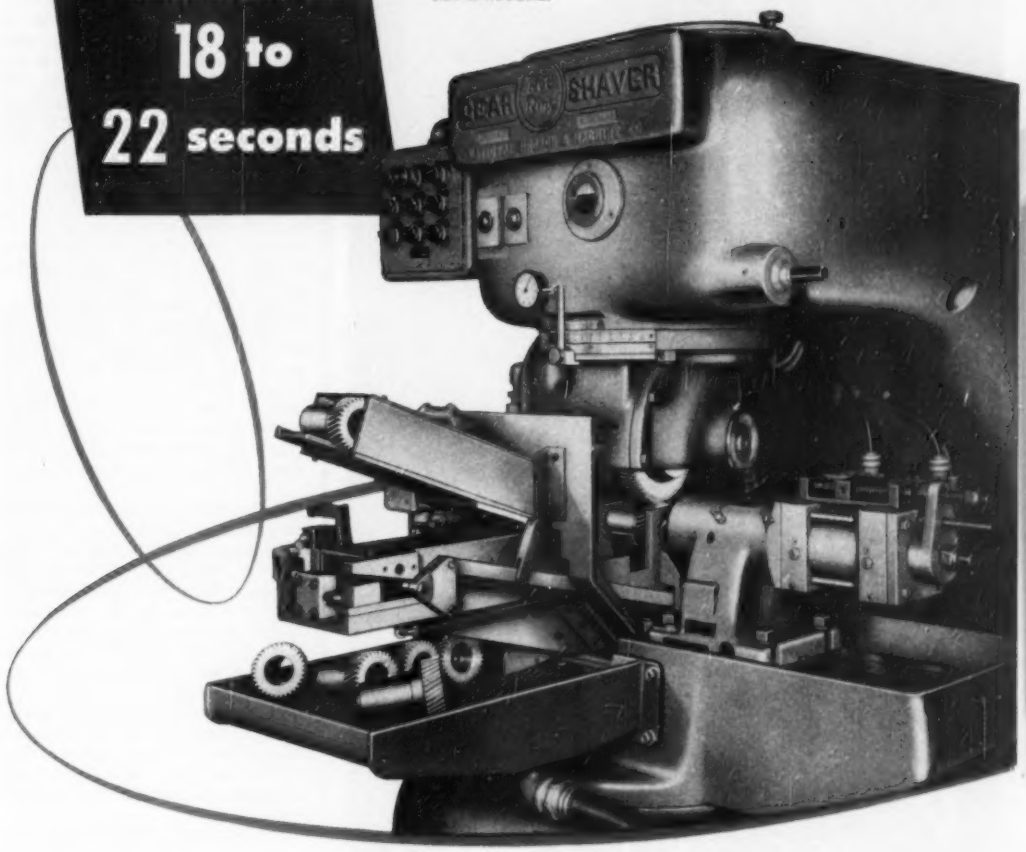
Transmission Gears

shaved in 18 to 22 seconds

The gear on this automatic transmission reverse drive sleeve is 2⅜" in diameter with a ⅞" face, 33 teeth and 14 normal D.P.

It is being shaved on this Red Ring Diagonal Gear Shaving Machine equipped for fully automatic loading at a rate of from 165 to 200 per hour, removing .0025" to .0015" of stock on tooth thickness. Rates up to 300 per hour have been recorded on smaller automotive transmission gears.

Automatic loading gives you not only the highest production rates, but it also minimizes operator fatigue and assures extremely close tolerance gears with ordinary machine operators—no special skill is needed.



WRITE FOR DESCRIPTIVE LITERATURE ON RED RING GEAR SHAVING AND AUTOMATIC LOADING

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CUSTOM MADE
at NO EXTRA CHARGE

Jarvis
TECNI-TAPS

JARVIS POWER TOOLS
TAPPING ATTACHMENTS
TECNI-TAPS
ROTARY FILES
FLEXIBLE SHAFTS and
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

mar the appearance and efficiency of the shop. In production there is a duplication of pieces, hence duplicate use of the same tools. It is not necessary to have the entire work area strewn with tools other than those used on the job. Such clutter slows down efficiency and production, for the worker loses much valuable time picking through needless tools.

William B. Harnden
Dorchester, Mass.

•

BY APPOINTMENT ONLY

THE IDEA of a plan that will encourage people to approach their foreman with matters with which they would like to discuss with him is a good one, as too often workmen are inclined to be reticent in such matters.

There are many times when a machine-shop foreman has reason to be in several places at the same time and he must determine which of them is the most urgent, that he may attend to each in their order of most urgent need.

There are times when a workman needs to consult the foreman regarding the job that he is working on but on account of the foreman being occupied elsewhere, cannot be seen at the moment, thus leaving the workman with nothing to do or idling his time away at something that does not count for very much.

Such occurrences are not uncommon, and at these times the operator has an opportunity to visit with a fellow workman, which in some instances stops both men from working, or he may go to a rest room for no good reason except to consume time. Whatever the reason, the machine tool would stand idle during the period.

A request for the foreman's time should be as explicit as possible in a brief statement, and ordinarily left at the foreman's desk or in very urgent cases placed in the foreman's hand.

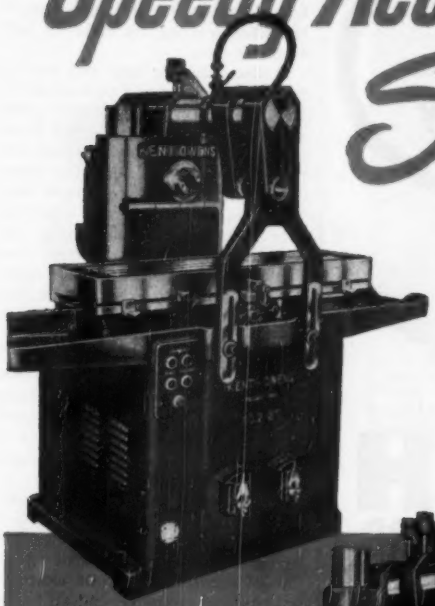
Printed cards calling for the most common needs with space for details might be used to advantage and save some time in writing.

H. B. Martin
Watervliet, N. Y.

•

IN AN old-time heavy machine shop, it was possible for the foreman to stick his feet up on his desk after he had got every machine running first thing in the morning, and even take a nap, and many did in the afternoon. Slow cutters, large heavy

Speedy Accurate Milling Saves Labor!



On countless jobs—Kent-Owens Milling Machines have shown ability to turn out work with top speed and high accuracy. They're designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more* . . . with *lower costs!* Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements.

Kent-Owens Machine Co., Toledo, Ohio.

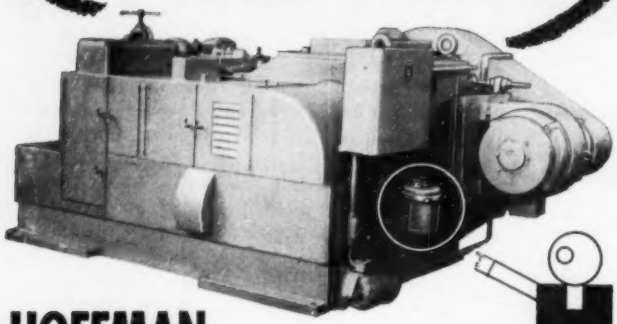
No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 2-20 DS Double Spindle for two milling operations . . . 20" table travel . . . 42"x12" table. Hydraulic feed.

No. 2-20V . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42"x12" table. Hydraulic feed.

Call on KENT-OWENS For Milling Machines

FOR BETTER OIL CLARITY —MORE ECONOMY



HOFFMAN DISC FILTERS NOW STANDARD on this Waterbury Farrel Hipro-Header

Despite a 10 to 1 difference in first cost, over previous filters, Hoffman Model I-6-15D Disc Filters proved more economical for Waterbury Farrel Foundry, builder of this high-speed Hipro Header.

Built to head bolts, screws, rivets, etc. from stock up to ⅜" O.D., this machine has a capacity of 115 units per minute. Extensive tests revealed that operation with the Hoffman filter meant greater lube oil clarity and longer filter disc life — thus, greater operating economy for the purchaser.

Hoffman disc filters have cleanable discs. Filtration at operating pressures up to 150 psi is accomplished without moving parts. Low maintenance cost. Write for Bulletin A669 for complete details *now*.

The I-6-15D

The I-4-15D

Hoffman Disc Filters, furnished in three sizes, may be installed singly or in units, to provide continuous clarification. Compact design for installation where space is limited. The I-4-15D delivers 1 to 10 g.p.m.; the I-6-15D provides 5-50 g.p.m. and the I-6-90D, 50 to 125 g.p.m. For the correct filter size for your requirement, Hoffman filtration engineers are at your service.

The I-6-90D

FILTRATION DIVISION U.S. HOFFMAN MACHINERY CORPORATION
211 LAMSON STREET, SYRACUSE 6, N. Y.
CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET, ONT.

pieces, speed and feed made this possible. But with up-to-date equipment, high speed and feed, plus carbide tools, there is not any time for any boss to think about just sitting in the office waiting for calls for help from his men.

If the foreman gets out on the floor, where he should be most of the time, and keeps in touch with every worker and every job, he will know every man's problem without the men having to go put their name down when they want advice or help. There will be some man who will rely on his own decision some day on an important job rather than bother you about putting his name down on the list, and his decision will be an error and a costly job spoiled.

An experienced foreman doesn't try to answer two or three workers at the same time, and he doesn't have to. A wise foreman will take each one in turn, in their importance to production, and settle and decide what is to be done.

You know that while practically every method, type of machine, cutting tool, and nearly everything else pertaining to the successful operation of a machine shop or toolroom has changed radically, and all to the good, during the last 50 years, there is one element, the human element, that is still the same, with all our weaknesses. The greatest asset in a foreman is constant vigilance on every job, contacting every man several times a day, and more often, if required. Follow that method conscientiously, and keep on pleasant terms with the fellow you supervise, quick to praise where warranted, disagree when necessary, quietly, but firmly, and you will gain their good will and wholehearted cooperation.

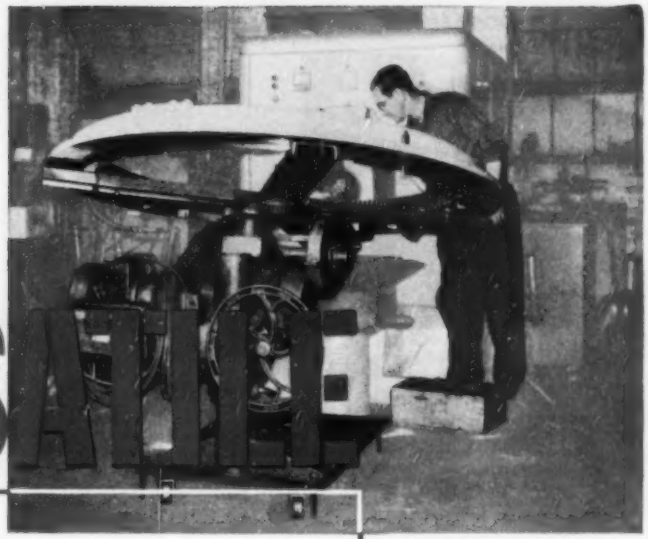
Arthur Silvester
Niantic, Conn.

•

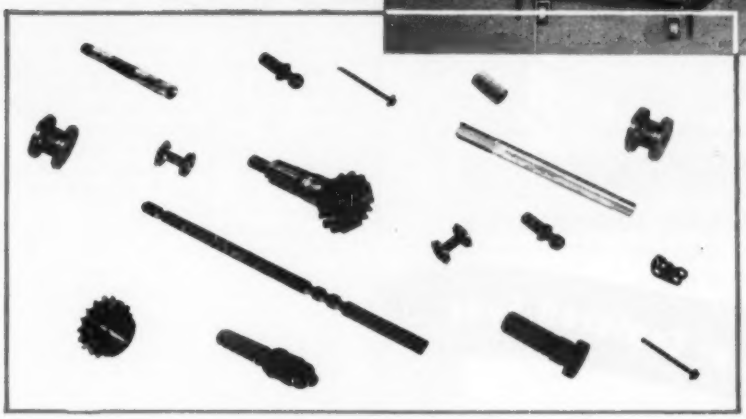
THIS CERTAINLY is a new slant on employee relations. Will it work? It would be foolish to say no, for today anything that seems likely to fail makes the grade. Under today's labor conditions and training given by the labor unions, the suggested system might operate like a charm. At least it would be along the lines of controlled freedom toward which so many workers both in office and factory are madly dashing.

The signing up to see the boss is new, but the idea of seeing your employees only when you want to is and has been practiced for years. Usually this takes the form of set office hours where, if you're lucky, you get in to the boss with your

VERSATILE



"Internal ring gear being hardened on the Lindberg LI-25 Induction Heating Unit".



Investigate the amazing versatility of the Lindberg Induction Heating Unit—approximately 2000 different parts have been selectively hardened or annealed on this typical commercial heat treating installation.

FROM THE LARGEST—The internal ring gear illustrated above—with a 60" inside diameter, 3½" face with 187 teeth each individually heated and oil spray quenched.

TO THE SMALLEST—This small 2" stamped metal rocker arm was selectively heated and water quenched on the small square face at the rate of 3000 per hour. Investigate this versatile Lindberg Induction Heating Unit—it may supply the answer to your selective heating operations.

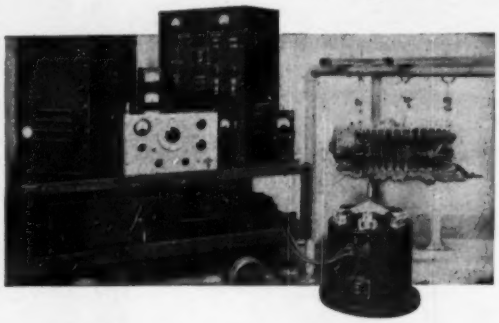
SPECIFY LINDBERG

for any heat treating or melting need! Lindberg manufactures every type and many sizes of melting and heat treating furnaces from tiny laboratory units to mammoth field erected installations—whether it's gas, oil, electric, arc, low or high frequency—consult your local Lindberg Office!

LINDBERG
HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY 2445 W. Hubbard Street, Chicago 12, Illinois

YOU CAN BE SURE.. IF IT'S Westinghouse



Explore . . . Test . . . Remedy

It pays off to fatigue test materials *before* production starts. Westinghouse Type HI Vibration Fatigue Equipment, illustrated above, has been designed to supply the resonant drive force needed in fatigue testing operations. Write for complete information on this or other vibration testing equipment. Westinghouse Electric Corporation, Department E-1, 2519 Wilkens Avenue, Baltimore 3, Maryland. J-02210

Westinghouse
VIBRATION EQUIPMENT

U-Bolts or Centered Eyes
rapidly duplicated with di-acro
HYDRA-POWER BENDER

An example of large radius forming.

At last—a PRODUCTION BENDER that "BENDS THEM ALL" — tubing — angle — channel—extrusions—moulding—strip stock—bus bars—and of course, all types of solid materials. U-Bolts and Eye-Bolts are just two examples of the shapes that can be rapidly produced in one operation with this hydraulic power bender.

The DI-ACRO HYDRA-POWER BENDER can be easily set up in your own plant for a great variety of forming operations, or it can be delivered completely tooled for speedy production of a specialized part. Investigate this universal machine before you buy any "single purpose" bender.

Send for 40-PAGE "DIE-LESS DUPLICATING" CATALOG

giving full information on all DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, Punches—also our offer of free DI-ACRO Engineering Service.

DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO DIE-LESS DUPLICATING
O'NEIL-IRWIN MFG. CO.
311 8th Avenue, Lake City, Minnesota

problem. If you don't make it this hour, then you come back at the next set visiting time. Is this successful? As a believer in freedom and a believer that every employee deserves the right to be heard when he wants to be, I would say it is far from successful in building good factory or office relationships. True, there are times that the steady flow of employees into your office may make you wish to be elsewhere, but remember that if so much traffic is going on then something is wrong with you as a manager. Isn't it better to have a forewarning of trouble than to have your boss call you on the carpet and tell you that you are not doing a good job? Remember good employee relationships will tell you much faster how you are progressing than a poor relationship will.

Then, again, would you like to be the employee who has to sign in to see the boss? Wouldn't you resent a little the fact that it was necessary to make an appointment? What if your problem was urgent? And aren't all of our problems urgent to us as individuals? Must we wait around for the boss to take his good-natured time to talk to us about the urgent case? I am afraid that I can't go along with this idea. In my handling of men I've found that if you treat them as you would like to be treated, little or no real trouble arises. But if you try to high-hat, put on the dog, or be a big shot, trouble is just around the corner for you. And it usually comes down with a vengeance, wiping out all the good you have tried to do.

It is hard to set any rules or regulations on conferences with your workers. Some of the workers can be asked to come back when it is possible to spend more time with them. Others must be talked with immediately and you must put aside whatever your task is and help them to solve their difficulties right then and there. This is frequently hard, for undoubtedly this will be the time when you have a rush job to do for your boss. Nevertheless, I have found it pays off in better shop relationships.

My suggestion is to leave the door open to your employees to feel free to come to you with their problems. Never slam the door in their faces. Listen to them and then, if you cannot spare the time or cannot answer their questions, set a time when you can and will discuss the entire problem with the answers available. Don't, however, seem preoccupied when listening. And don't under any circumstances ask the employee to

You can make "OVERHEAD" Pay a Profit...

with Swift Trav-Lift Crane Service

Heavy loads need not mean heavy costs when you have "thru-the-air" handling. No congestion, no delays, no excessive costs *this* way!

THE P&H TRAV-LIFT gives you one-man handling of loads up to 15 tons. You lift and transport, lower and stack — anywhere in the entire area served by the crane. And *all* without rehandling!

The Trav-Lift is custom-built to your requirements from cost-saving standard designs. It has all the P&H Added Value features that mean more dependable, lasting service. It's a product of P&H — America's leading builder of overhead handling equipment.

P&H Trav-Lift Cranes are built in capacities up to 15 tons

Get the Trav-Lift Story. It means new economy and efficiency in your handling if your service needs do not warrant investment in a heavy-duty crane.

These added values

protect your investment

VARIABLE SPEED FULL MAGNETIC CONTROL provides 5 distinct steps for all motions: controlled from pendant push-button or from operator's cab.

SAFE — Only 110 volts at the push-button when floor-controlled. Start-stop main line contactor, disconnect switch, thermal overload protection, magnetic limit switch and powerful brakes assure maximum safety.

ALL-WELDED BRIDGE AND TROLLEY incorporates the most important factors in reliable service — rigidity, safety, accessibility.

LIFE-TIME CONSTRUCTION — Motors designed specifically for crane service — high starting torque, frequent reversal. Shaved gears, grease sealed antifriction bearings throughout.

COMPETENT ENGINEERING SERVICE—P&H materials handling engineers will gladly give you their years of experience in working out your particular problems. Write us.

Handle it "THRU-THE-AIR" at LOWER Cost

P&H TRAV-LIFT CRANES

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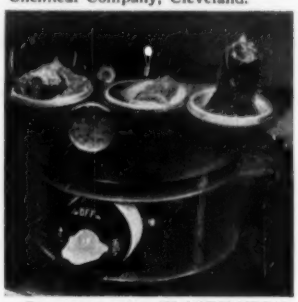
EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS and ELECTRODES • SOIL STABILIZERS • CRAWLER and TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

"SUCCESSOR TO GREASE" NEVER MELTS

MULTI-PURPOSE LUBRICANT

Plastilube called most important lubrication development in 20 years.

PLASTILUBE, the remarkable new multi-purpose, non-melting lubricant is today solving high-temperature and other lubrication problems for many of America's largest industrial and automotive users. In five short months, over 1000 concerns have tested and now specify this new product of The Warren Refining & Chemical Company, Cleveland.



One reason for PLASTILUBE'S sensational acceptance is the fact that it will not melt. The picture shows equal quantities of barium grease (left), lithium grease (center) and PLASTILUBE on a hot plate with a temperature reading of 345 deg. F. Note that the barium and lithium are melting rapidly while PLASTILUBE is unaffected.

In addition to the non-melting feature, PLASTILUBE possesses greater adhesion, excellent pumpability at low temperature, is exceptionally resistant to the washing action of water, and will not break down during working — allowing longer service life and consequent economy in use.

PLASTILUBE, "the successor to grease" is made by a radically new process combining Warren's I-45 and BENTONE (a product of National Lead Company). There is no comparable product on the market. It is rapidly being recognized as the most noteworthy development in lubrication since the first use of additives in motor oil twenty years ago.

For further information, samples, etc., write The Warren Refining & Chemical Co., Dept. AM-4 Cleveland 15, Ohio. *(Advt).*

repeat his problem. Watch your employees and see that they are not too demanding of your time. Sometimes you are at fault in having so many questions to answer. Train your men to think for themselves and, if in a position of responsibility, take on what they should in order to rightly hold down their job. If these rules are followed it is seriously doubted that you need to set hours or run appointment lists.

Charles D. Townsend
Fort Wayne, Ind.

•

WHETHER formal conferences pay off or fail to do so depends entirely on how they are conducted. During the last six years I have seen both kinds, in which the following tells the story briefly.

For one year, one-hour conferences were held each week during which the man in charge talked to 20 to 30 engineers, who occasionally had the opportunity of asking questions. Most of the time was taken up by the department heads' talk and while it was interesting at intervals its effect on the morale of the "gang" or its helpfulness in advancing the progress of the job was highly doubtful. The man conducting these conferences was neither good nor bad, he simply had a good idea but did not know how to handle it.

Another plant had a head man who called one-hour conferences weekly and others in between if things did not move as they should. This man knew how to develop leading questions and he got things done and he moved up.

His interim successor did not believe in general conferences, could not handle them and killed them every time he got a chance to do so. He liked to get three or four men together and tell them what the answers were and wave his baton. The result was that morale went to pot, while this man's authority was curtailed and another man stepped over him.

His successor regularly holds general conferences at which each person has the opportunity of bringing up anything which he may believe to be of interest. In addition he holds weekly luncheons for the foremen of all grades during which they are told of the state of the company business, something of its plans and are invited to ask questions. Questions are asked and they are answered. The number of foremen per luncheon is limited, but the attendance is so scheduled that in the course of a month all have attended one luncheon.

Of course it is easy to let any conference degenerate into a pointless "talkfest." Keeping them from doing so is the job the man presiding must handle but if he knows his stuff there is not the least doubt in my mind that they pay off.

Ira A. Butcher
Cincinnati

•

COST SHARK

ANY SYSTEM of incentive is better than the customary apathy that usually attends the perfunctory hourly effort. Were man made of the stuff

LUCKY GUY. I WAS NEVER FORTUNATE ENOUGH TO HAVE SUCH AN ACCIDENT
YOU DOPE. Y'NEVER MOVE FAST ENOUGH TO HAVE ACCIDENTS.
"INCIDENT 4 ACCIDENT"

Check Thread Accuracy... VISUALLY

WITH Hanson-Whitney *Precision* THREAD COMPARATOR

This precision instrument, expressly designed for production gaging, has proven itself since 1945 in checking all forms of threads including critical aircraft threads . . . and is now available to producers of external threads from 0 through 3⅛" diameter, coarse or fine pitches, in all classes. (Class 5 should be specifically requested.)

The indicator tells at a glance whether your product is over-size, undersize, eccentric, tapered, or if lead error exists. The work is recorded visually to accepted ring gage tolerances thus eliminating the human error-possibility of "feel".

Checking up to 20 pieces per minute . . . 3 minutes to change thread dia. units . . . means lower costs, greater flexibility, for both production and inspection departments.

FAST

ACCURATE

ECONOMICAL

1. Indicator is equipped with tolerance hands and is graduated in tenths of thousands. Any type indicator with ⅜" shank may be used.

2. Comparator easily set to desired reading by loosening knob and lowering indicator. Tighten knob screw to lock indicator in correct position.

3. Lever controls positioning of upper anvil. Can be easily raised or lowered to insert or remove work. This action eliminates excessive wear on anvils.

4. Comparator is easily set — insert setting plug, lower upper anvil. Set indicator at tolerance required.

5. Thread anvils are actually a split internal thread member to check assemble-ability and to give exact reading on indicator dial of part checked within .0002 accuracy. Anvil core hardened to 60-62 "C". Standard unit will check any P.D. from class 1 to 4 and only one set plug (of known P.D.) is required for all classes.

Standard recognized 2½ lb. pressure is maintained on work to hold it in reading position, eliminating human element while taking reading.

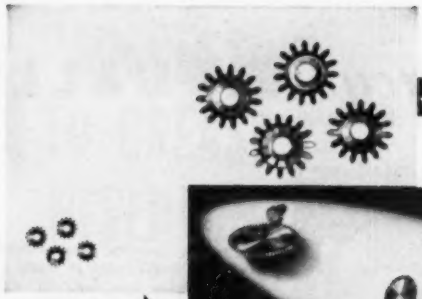
6. Complete gaging unit may be removed by loosening screw for change in size setting. Can also be used after removal for checking parts on machine. Complete removal and resetting accomplished in less than three minutes.

BULLETIN ON REQUEST

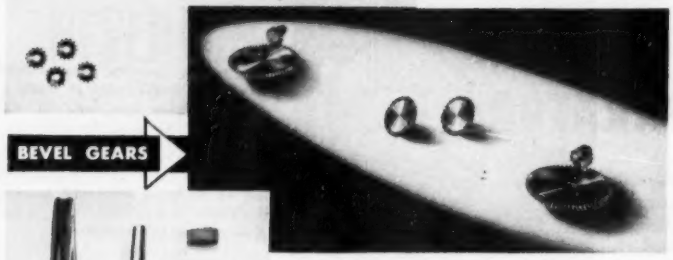
HANSON-WHITNEY COMPANY, HARTFORD 2, CONN.
DIVISION OF WHITNEY CHAIN COMPANY

Bulletin shows detailed various parts of the H-W Comparator (all available separately). Send for your copy today.

SHW80

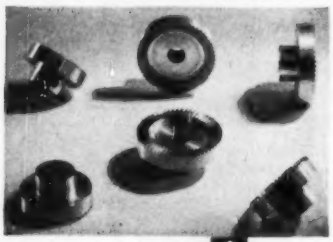


SPUR GEARS
(Enlarged to show tooth form)



BEVEL GEARS

WORMS, WORM GEARS, SPIRAL GEARS



CROWN GEARS

HAMILTON No. 1 PRECISION GEAR HOBBER
(Capacity:—6" diameter of gear blank)

Install a Hamilton No. 1 Precision Gear Hobber and make your choice:—the same hourly production as formerly with far more precision, or the same precision as formerly with greatly increased production.

Ask for Bulletin H-1-49

A few DEALERSHIPS are still available.

THE Hamilton TOOL COMPANY
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

we all hope for, and produced at his very best, incentive rewards would not be necessary. Man is by nature a selfish individual and is out for all he can get. If he can get it with little effort; so much the better, he thinks.

Time estimates placed on jobs should be made by individuals who are experienced enough to do justice to the job. If a job is broken down into its elements and an estimate made in detail, taking into consideration any possible contingency that is likely to arise, the estimator is likely to arrive at a fair figure. It may be advisable to submit the job of estimating to a committee of men of experience who can check each other. The danger of bankruptcy can be stricken out because the anticipated reduction in working time will correspondingly reduce the overburdening overhead that accompanies a job of extensive time consumption. Any system that will promote extra effort on the workman's part will naturally revert to the company's benefit, even though the workman has to carry off his earnings in a gunny sack.

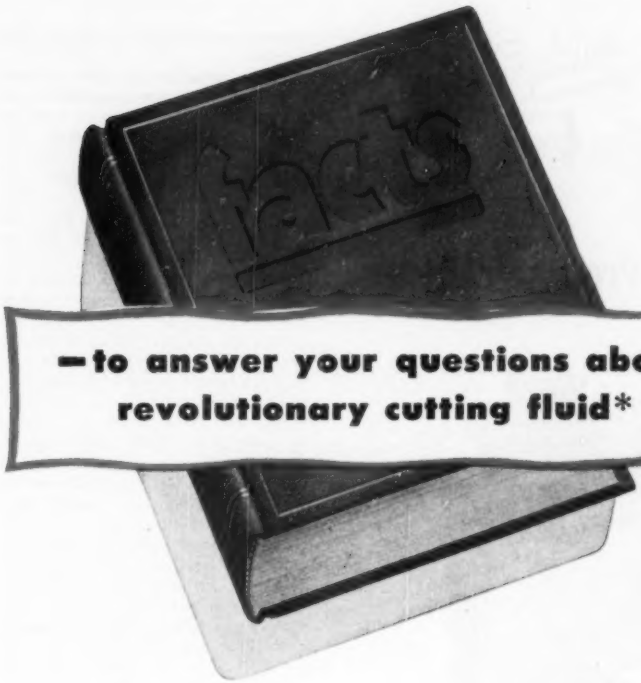
It will be up to the supervisors and inspectors to see to it that no reduction in quality accrues through the worker's zealousness to complete the job under the time allotted to him. One will usually find that such kickbacks will prompt the worker to resort to short cuts and lead him to avoid putting unnecessary finish where it is not required. Experience will show whether estimates are placed too high and you can bet your bottom dollar that the men will squawk if the time is placed too low for them to make their effort worth while.

John Homewood
Ontario, Calif.

•

ANY MAN endeavoring to install estimating as a requirement in a shop deserves the sympathy of us all. In a good many cases about all he will wind up with are a few condolences, many headaches, and an over-all buffeting from invectives.

The recent war saw estimates in all but the most iron-disciplined cost-controlled shops hurled out the window. Logical reasoning of "Get the stuff out fast—to h--- with the cost" provided a face-saving shortcut, elimination of one heretofore necessary operation, to overworked supervisory personnel. Faced with an existing situation, or rather its lack, the younger generation upgraded by accelerated expansion were and are only too willing to comply with such details of omission—if they were



—to answer your questions about this revolutionary cutting fluid*

Q. Will ANTISEP All-Purpose Base work safely in automatics?

A. *Yes. It has been and is being used in every type of screw machine. The Houghton Man has data on how to clean up machines before installing and how to handle machine lubricant mixes.*

Q. Will ANTISEP A. P. Base gum up, or cause gumming?

A. *Any gumming which might occur is the result of putting this coolant in dirty machines. The new mix should be run for a day or two and then dumped to get rid of "gunk" loosened by the washing action of A. P. Base. Water softener may be needed in some localities.*

Q. Will Antisep A. P. Base live up to its name as regards antiseptic value?

A. *Yes. No dermatitis complaints have been recorded. A powerful germicidal additive prevents growth of "bugs." Operators like the antiseptic ability of A. P. Base.*

Q. Should Antisep A. P. Base be used for grinding?

A. *Not usually recommended for grinding, as film strength additives tend to load up the wheel. Here we advise ANTISEP SOLUBLE GRINDING OIL.*

Q. Can this Base be used as a drawing lubricant also?

A. *Yes. It may be mixed with equal parts of oil or water and used for stamping or punching.*

Q. Will Antisep A. P. Base clean readily from the work?

A. *Yes, in any mild alkaline cleaning bath, emulsion cleaner tank or standard degreaser.*

Q. Will Antisep All-Purpose Base save me money?

A. *Yes—mixed with water, it costs between 6 and 8 cents per gallon, depending upon the dilution. Compare that with your 22 to 45 cent straight oils!*

For answers to any further questions, prices and application data, write E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.

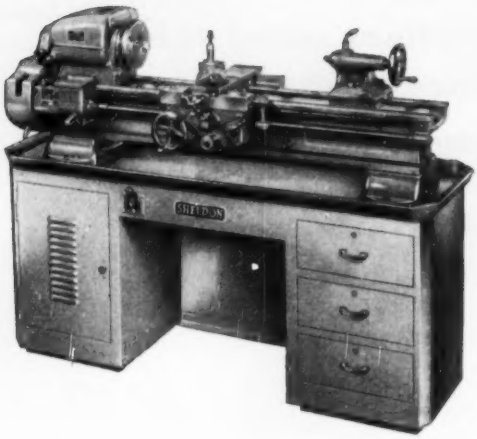
*** HOUGHTON'S**

ANTISEP

All-Purpose

CUTTING BASE

Replace for PROFIT with SHELDON Precision Lathes



The great bulk of tool room jobs come within the capacity of Sheldon Precision Lathes—can be done with equal accuracy, at lower tool cost, lower power cost, in less time, *and at greater profit* on a Sheldon than it can on many of the costly, cumbersome, space-wasting older lathes found in most shops.

These extremely accurate (Zero Precision Taper Roller Bearings), large capacity for size (1⅜" hole thru spindle), light, fast, easy to operate, space saving, moderate priced lathes will turn out not only more pieces per dollar, but on many jobs, more pieces per hour, than most older large lathes. When figuring replacement of obsolete equipment, remember you can have two or more of these efficient little money makers for the tool investment you made for the large lathe you are replacing.

Write for Catalog

SHELDON
CHICAGO

Sheldon Machine Co., Inc., 4234 N. Knox Ave., Chicago 41, USA

aware at all that such practice once existed.

There certainly is little, if any, argument with the case when presented flatly as "The stuff must be made"—either they want it or they don't. This is particularly true on purely shop jobs—contingent, repairs, expansion, additions, modernization, and the like. No one can argue that if an area of flooring should be repaired it still must be fixed whether it costs $.75, $1.50 or $2.00 per sq ft to accomplish the job.

A department head, engineer, supervisor etc., accustomed to operating without the check-rein of budget or appropriation set beforehand or the necessity of facing an aftermath accounting, finds trying to estimate or operate for such an innovation well-nigh impossible. Either he is untrained by total inexperience or, what is worse, has slipped into methods of work or supervision involving others than himself which he finds uncorrectable overnight. Likewise, without a record of previous costs or practice, the now "estimating-executive" finds his fund of know-how whittled way down to a point, he must feel, rather on a level with a newcomer. Especially so when he tacks on the end of his appropriation requests or estimate—"contingencies 30%."

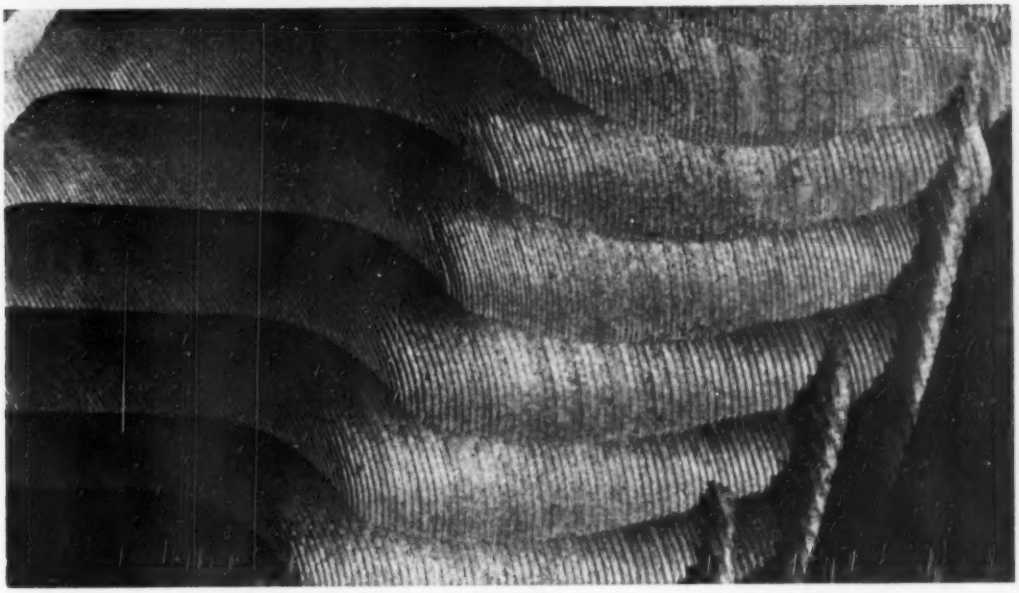
After all, to use costs of previous jobs done as a basis for future ones requires correct application of all factors involved. Labor, material, and overhead are constantly shifting and frequently not in the same proportion—one to the other. Translating these figures to fit a present condition, highly unlikely to be a duplicate in magnitude, model, or location is quite complex enough without endeavoring to recall or decipher just what percentage of a large reserve amount was necessary to cover what specific contingency. Therefore, while giving appearance of being a help—such overly large allowances are a hindrance and any constant user is leaning on a very shaky crutch.

On the other hand, proper use of costs are an attribute to every phase of industrial management and at all levels. Certainly any man who sets himself a budget or estimate is going to do his darnest to not only live within it—but strive to effect savings knowing results will be the measure of his success. Where these figures are set for him by others—the same applies. Sometimes more strongly because he may feel they will be open to a closer scrutiny.

At this time mention should be made that it is neither fair nor wise

THERE'S MORE TO THS PICTURE

than first meets the eye. You'll find the entire illustration from which this enlargement was made on Page 249.



"Close-ups"

. . . show you what goes on at Allied. Plant photographs, illustrating a wealth of modern equipment in four large factories, could only tell a small part of the story. You have to get close to many individual operations—in production, engineering or even clerical departments—to see the true picture of Allied's careful attention to even relatively unimportant details . . . all of which add up to good products and good service.

ALLIED PRODUCTS CORPORATION
DEPARTMENT 54
12605 BURT ROAD • DETROIT 23, MICHIGAN

HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • ALLITE ZINC ALLOY DIES • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

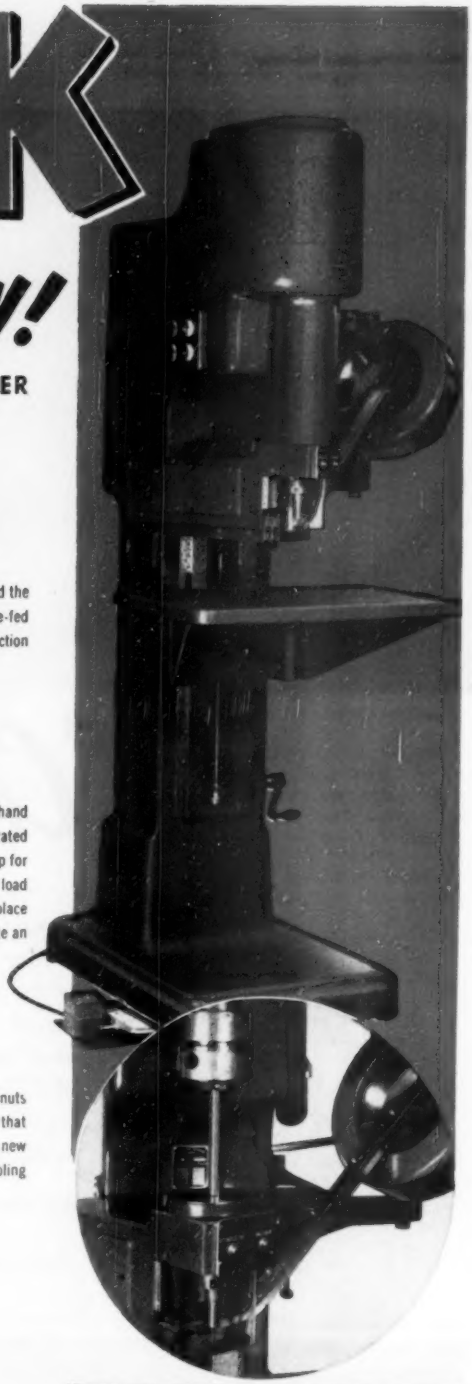
LOOK

what's NEW!

A WONDERFUL TIME AND LABOR SAVER

DETROIT NUT DRIVER

Again the Detroit Power Screwdriver Company leads the way . . . Having whipped the problem of production screwdriving by replacing slow hand methods with magazine-fed power-driven screwdrivers, it now breaks another bottle-neck by the introduction of this new Nut Driver.



IT WILL REVOLUTIONIZE NUT DRIVING METHODS

Instead of the previous costly, slow method of placing the nut on the stud by hand and then tightening it by an air or electrically operated hand tool or a hand-operated ratchet wrench, this machine will drive nuts semi-automatically, or it can be set up for automatic operation, entirely eliminating the manual handling of nuts, except to load the hopper which feeds the nuts to the driving spindle. The operator has only to place the assembly on the locating fixture on the work table of the machine and actuate an electric foot switch.

WIDELY ADAPTABLE
Will Fit Your Requirements

Capacity: Nuts, 5/16" min. to 13/16" max. across flats . . . Equally efficient for special nuts such as Jam, Castellated, Lock, etc. . . . Machine will drive any nut within its range that can be selected and fed in a uniform position. Get our new catalog describing this new Nut Driver, also Power Screwdrivers, Motorized Hoppers and Special Assembling Machines. SEND SAMPLE ASSEMBLY FOR PRODUCTION ESTIMATE.

Mail Coupon for Catalog

DETROIT POWER SCREWDRIVER CO.
2797 WEST FORT ST., DETROIT 16, MICHIGAN
Yes, send along your new catalog . . . sounds interesting.

COMPANY NAME_____
BY_____
STREET ADDRESS_____
CITY_____ STATE_____

DETROIT POWER SCREWDRIVER CO.
2797 WEST FORT ST. DETROIT 16, MICHIGAN

to set a sum for the doing of work without explaining and getting the approval before commencement of the task by the man who is going to be directly responsible for its accomplishment. It may be an old adage, but "two minds are"—still—"better than one." By the same token, if tools are available and applicable to the job, better to use than not. Good, accurate costs are tools of management. Estimates and budgets the blueprints for their use. Any shop man therefore can profit by their judicious application. Wise practice in this as with his other work is required. Just as there is no percentage to be gained by running a small lot through an automatic screw machine, so little economy is realized from figures whose cost to accumulate far outweighs either the actual job done or the information supplied as is so often done by a misguided "Cost Shark."

A. M. Elliott
LeRoy, N. Y.

•

REAL estimating is a mathematical art and is not to be sneezed at by anyone. Perhaps Ed knows this, doesn't feel capable of doing estimating, so is not at all favorable towards the new order.

As far as it's being the foreman's job to make estimate, it may be a matter of circumstances, for, in the large plants, estimating is a branch of the business all by itself and requires men who know their onions to do this work. On the other hand, in a small shop where a few men are employed, the foreman or even the proprietor may do the estimating.

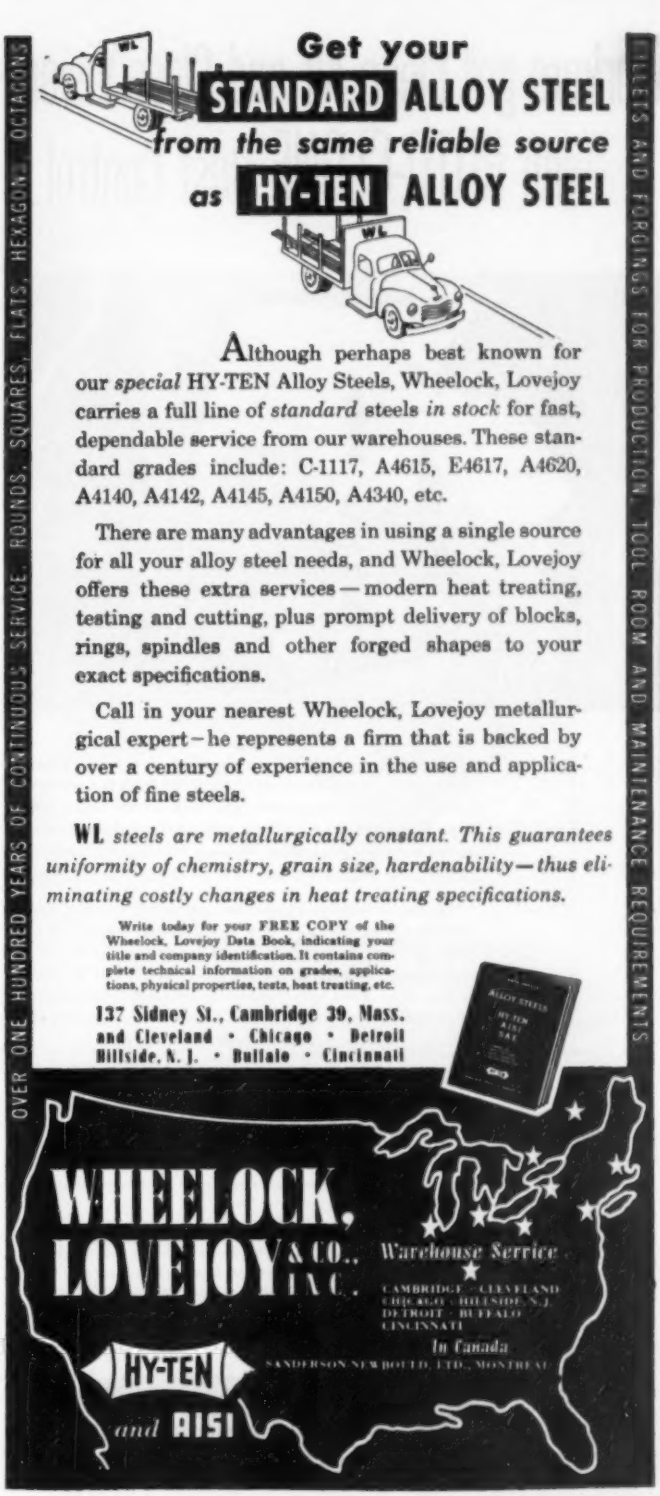
Now, with all possible care in such matters, there will be an occasional slip-up.

Take, for instance, the case of an order, placed by a foreign country, with a company where locomotives are built, for a narrow-gage four-wheel engine.

There were many calculations made to cover the cost of purchasing of a lot of parts and the manufacture of many at home, then there was a lot of figuring in order to properly distribute the weight and last, but not least, the cost of assembling, etc.

When the locomotive was ready for operation, it was found that the ash pan would drag in the mud.

What was done to overcome this blister? The wooden bumper beam on the front end was removed and used as a pattern for a cast-iron bumper. It was properly drilled, then bolted in place, and, behold,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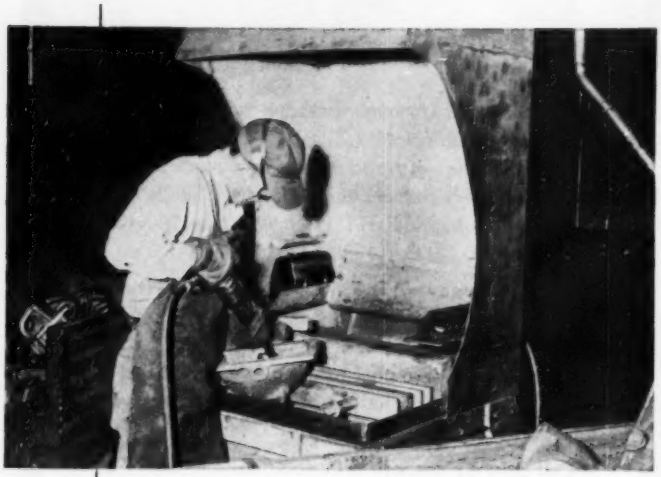

THEY don't "let the chips (and dust) fall where they may" in this foundry. Pictured here is a modern down-draft chipping booth which is served by an AAF Type D Roto-Clone.* Chips and dust are drawn off as fast as they are generated. Worker comfort is vastly improved and he has a clear view of the job at all times.

No matter what you grind or how you grind it, a Type D Roto-Clone will give you positive dust control. This compact, self-contained unit combines the functions of both exhauster and separator. All operations—drawing in the dust-laden air, separation of dust, delivery of collected material to storage hopper and expelling the clean air—are performed by one moving part.

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DUST CONTROL EQUIPMENT

the engine was in perfect balance.

Question. Who slipped? Why, the mathematician who calculated the distribution of the weight. This man has been making these figures for several years and had made very few mistakes.

If the foreman finds that his duties in the shop are so profuse that he must do his estimating evenings at his home, then it becomes unfair to ask him to do it for he needs the relaxation after working hours.

On the other hand, if his department is running in a smooth manner because his men know their jobs and, hence, do not pester him with questions and discussions, he may have the necessary time to do the additional work.

F. H. Stebbins
Worcester, N. Y.

•

ESTIMATING shop costs in my judgment should not be part of a foreman's job. In the first place, lots of foremen do not have the ability or experience. It is a far different thing for a foreman to say, well Bill I reckon that job is worth $10 to sitting down on his own desk and figuring out all that the operator has to do, from setting up to the feeds and speeds, grinders, gaging, etc., and then putting all these on an estimate sheet to show how he arrives at the final cost of $10. The former is guesswork, the latter is really estimating cost.

All this does not mean that the foreman should not be consulted when estimating shop costs. It is common every-day practice in lots of plants when estimating to obtain a contract for an estimator from the office to go into the shop and talk with foremen and find out exactly what equipment or tools there are available to use on certain work.

That is intelligent cooperation and the foremen are only too glad to be of assistance, as they are just as interested in keeping shop costs as low as possible.

It is true that today if you were to give a blueprint of a job to a dozen different foremen and there was say, 30 hours actual work, and give it to each one separately, and neither knew the other had been requested to estimate the time and cost of the machinery you would get a dozen different and widely varying estimates and it would be most unwise for any cost department to take such figures in estimating cost, to figure on getting a contract.

This is not to infer that the foremen are not highly efficient, as foremen, but on any estimate, where

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the job might be over 10 hours work and involves different operations and machines, a trained estimator is absolutely necessary due to the fact that if there were say hundreds or more of a certain piece of work, and a real competitive figure has to be arrived at, you can't take any chances by taking what would be only a rough estimate.

For years estimating was my job and that experience as an estimator of shop costs made me aware that it would be impossible for Ed to take care of his supervision job and all necessary detail that go along such as instructing the fellows, seeing that they follow them, and making sure each has a job to start on as soon as he is through with the job in hand. So in my judgment if Ed's forced to also estimate costs, neither could possibly be done justice to. Therefore, estimating costs and supervision should be kept on a purely separate basis for best results.

Arthur Silvester
Niantic, Conn.

•

IN SUCH a problem there are three major factors to be considered. First, is the department of a mass or semi-mass production type? Secondly, is the department a job-shop type? The third factor is whether or not the department is a machine or maintenance department.

In the case of mass or semi-mass production of items, the solution of estimated cost is quite simple. Each department involved operates on a standard cost system—an estimate set up either by time study or previous data to indicate the cost of the product being produced.

In job-shop operation, it is not possible actually to establish a cost pattern by time study because the jobs are usually of a very different nature and freqeuntly are never repeated in the same way. Here you might say is the chance for the foreman to do the estimating. Most up and coming companies have found that a foreman is too valuable to tie down to routine estimating, so an estimating department is established to work with standard data that can be established by means of time checks on elements that are repeated such as reach, group, transport and put away. These elements are constant for certain operations. From this standard data it is possible to estimate a job quickly without a lot of thinking or digging through old records. The cost established is more accurate than an educated guess that most foremen are forced to give. The

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cost of this estimating group soon pays for itself by being able to set cost figures that are well in line and that the company can use in quoting prices for the job. Profit can always be made if a proper estimating department is established.

Maintenance or machine shop departments are not directly tied into production cost, but are more generally associated with operating costs. These costs are important and perhaps more so than production costs, because of the fact that they are more often out of line.

The work is difficult to measure. Probably it is never repeated and if it is, usually it has to be combined with some other factor that cannot be foreseen. How, then, can we control this? The method outlined in the earlier discussion is an approach. Have the foreman set down the time estimate in dollars and cents for the job to be run.

Here, however, if the foreman misses the estimate by ten to 20 percent the company is not going to lose money on the work because the work is not being sold. True, the department will show a loss if the estimate is badly missed. Then you may ask—what good is it?

If a budget is estimated for these operating departments to work on during the year based on plant activity then the foreman has to operate his department like any business. He has so much money he can spend and he must distribute it over the needed items. This closely controls the cost to the company of the operating department. The company knows about how much is to

"I want everything to look natural . . so when the visitors start coming thru, a few of you hang around this machine."

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He checks every piece of mechanical equipment he owns for wear, lubrication, efficiency.

Yet he fails to take the simple precaution of a Chest X-Ray to make sure he does not have tuberculosis. *Not because he's opposed to the X-Ray. Simply because he is not sufficiently informed—or just hasn't taken the time and trouble, or does not realize the seriousness of the problem.*

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So, if you're the man above, that one simple reason should make you get your Chest X-Ray—*today*. But listen, see how serious this really is:

Between the ages of 15 and 34, tuberculosis leads all other diseases as a cause of death—although at no age are you safe from TB. Yet, if everyone does his part by getting a Chest X-Ray periodically, and the majority of cases thus discovered are followed up, we can eliminate TB entirely as a public health hazard!

Will you do your part today? Get a Chest X-Ray. It may mean your life!

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be spent each month. When the foreman sees his expenses getting out of line, he will talk with his superior about it instead of just letting it ride.

Now to the meat of the problem: Should the figures be put on the work-order copies? The shop copy should not carry any information regarding time or cost of the job. If a time is placed on a job by a foreman and given to a worker, that individual feels he is being whipped into getting the work done. If the foreman says "don't pay any attention to the figures," the worker soon drifts along on the job. If this time set for the job is low the worker is being driven. If the time set is too long, then the worker will tend to loaf along on the job. Both conditions are bad. Have the foreman tell his worker whether it is a rush job or not. Have the foreman follow through on the job—don't let him sit down and say "well I put the time on the work order and the worker knows when it is to be done."

Charles D. Townsend

Ft. Wayne, Ind.

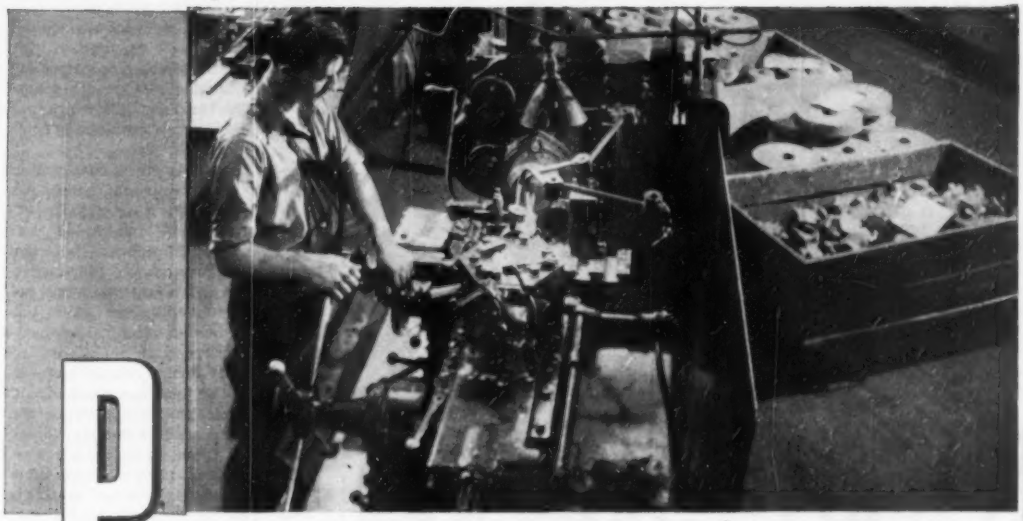
•

"EMPLOYMENT PREVIEW"

THE EMPLOYMENT specialist rather than the foreman is better able to weed out incompetents, malcontents and drifters by the very nature of his specialized training and experience. His knowledge of proper hiring procedure, including adequate interviews and tests makes him the proper and most efficient hiring functionary.

Records show that plants which have centralized in a functionalized employment department the hiring and maintaining of the working force have lower turnover figures than those which have left these phases of operation in the hands of the foremen and other department heads.

Centralization of employment work for the production forces, under the direction of a hiring specialist, can be justified on the following grounds: Although the foreman may have much knowledge of the detailed requirements of jobs, his experience and the time that he is able to devote is not such as to usually make him expert in the selection of workers; the foreman cannot be expected to develop outside contacts as sources of labor in a way that a centralized department can; individual foremen are not in a position to perceive the needs of the plant as a whole, and thus the centralized department is more likely to achieve that uniformity in selection which makes for a generally high character



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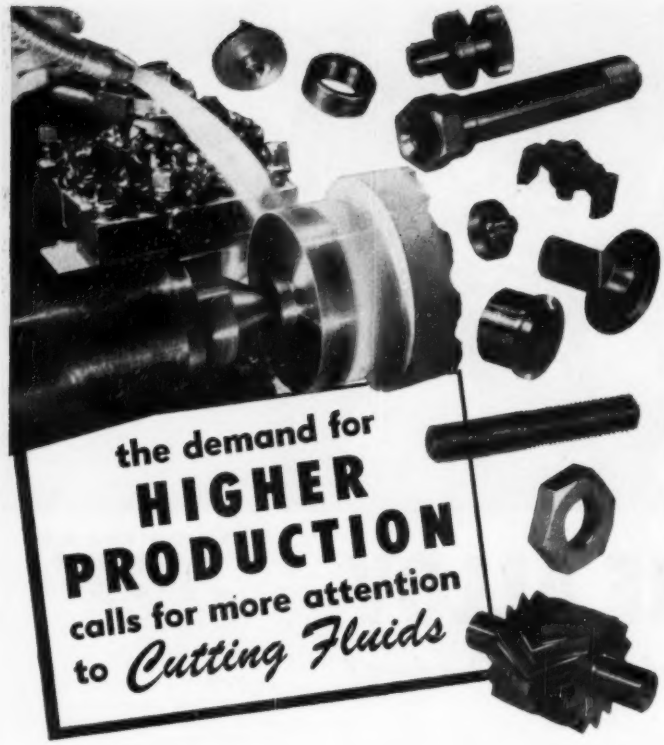

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of personnel and morale, to place an applicant in the department for which he is best suited, to better arrange in merited cases for a transfer of jobs, and to better prevent undesirable former employees from being rehired.

As a means of insuring cooperation between the employment manager and the foreman it is usually essential that it be understood that final selection of applicants is in the hands of the foreman. At times, after an employment department has become fully established and has gained the confidence of all departments, it is possible to place full responsibility for the selection of employees in its hands; but there should always be an interview between the applicant and the foreman before final employment, so that the former may see what kind of a person he is going to work for and not meet his "Boss" just as he is taking his coat off to get to work.

Efficiency in hiring is necessary in plant operation. Standards must be set, and uniform policies and procedures established; and the centralized employment department is better able to carry out the personnel program than operating executives such as foremen.

Harry Kaufman
Philadelphia

•

SINCE Ed is going to use or apply the ability and experience of a new worker, he should definitely find out what the company is buying for him to use. It is similar to buying a new machine; if Ed would see the performance of a new model machine, a salesman would not have to expound various performance facts.

Al should realize that an applicant could put Bowman "behind the eight

"Maybe I should re-enlist"

ball" by talking technical and fast, unless Bowman has Ed's knowledge and experience. Whereas, Ed could ask questions in detail, of work he has in mind for applicant. If he sounds "fishy," get an understanding that he will be on probation for a week (as an example) at a certain rate or, much fairer yet, Ed should tell him to work on trial for a week so that Ed can evaluate his results, in comparison to all men in the department. In that way, Ed can feel justified in recommending his continued employment and working wage and keep harmony in his department.

Al is wrong in saying that the interview takes up a lot of time, as Bowman can take care of the preliminary quiz and Ed can be called in for the final or technical questions and also get acquainted. Since Ed is a practical man, his questions naturally are more pertinent and more satisfying than questions based mostly on theory. The applicant can answer Ed much better than Bowman, because they both speak the shop language and appreciate the details of the job.

John P. Podlecki
Kitchener, Ont.

•

LITTLE PLANT SCHOOLHOUSE

THREE points determine actual net worth, negative or positive, of a postgraduate course for foremen. One of these is the actual curriculum. If it is made up in any appreciable part of antedated or obsolete stuff, the course will certainly be a liability rather than an asset. Another point is the teacher. A poor teacher can of course definitely ruin all chance of getting a really good course of study across. The teacher must hold at least a modicum of the respect of his pupils. The third point is the degree of psychological finesse with which the idea of such a course is "sold" to the potential students.

The natural reaction is for a foreman to resent the proposition of such a course. Yet there are many cases where men who have initially objected to it have hailed it with enthusiasm after they have gotten into it, if it really gives out with something that will help them in their work, and if it appears that the teacher "knows his stuff." If it can be honestly represented that the teacher is a "shop man" of long experience, most foremen will go to hear him with far better grace than if there is any room for suspicion that his knowledge is academic rather than practical.

Generally, it will be unwise to

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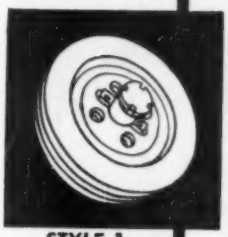
Flywheels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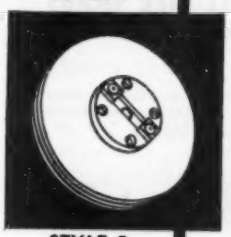
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Lovejoy Flywheels are available for mounting on the spindle of any machine . . . Style 1 for driving shell end mills; Style 2 for bolt-on mills; Style 3 for bolt-on or National Standard arbors.

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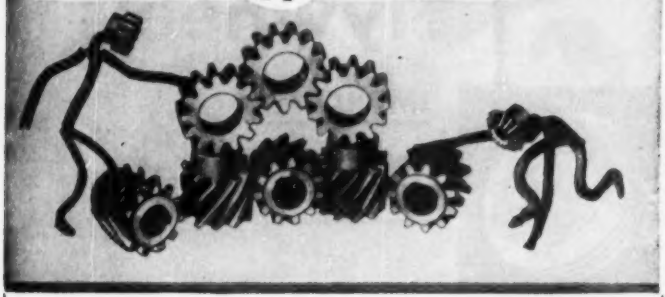

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make the attendance of foremen for such a course of study compulsory, unless it be made compulsory to attend one or more initial classes on company time, with the idea of later giving foremen their choice as to whether they wish to attend on their own time thereafter. This will sell a foreman on the idea that the company really believes the thing to be worth while, since they are willing to go part way and invest some of their own time in it. Too, having attended such initial classes on company time, a foreman cannot help knowing that he would be particularly conspicuous by his absence at remaining classes in such a course. Most foremen will attend under these conditions, if possible, unless the study is patently unprofitable, even though they realize that a certain degree of psychological coercion is resident in the situation.

One highly strategic method of approach in obtaining willing consent to attendance on such a course is to call a prior meeting of the foremen, at which time they will be given opportunity to hear a brief outlining of the proposed course of study by the potential teacher, and to actually look over a well-developed outline of the proposed curriculum.

John F. Hyler
Peoria, Ill.

NEW BOOKS

RESISTANCE WELDING. *By Wallace A. Stanley. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 329 pages, 8½ x 11½ in. Price $7.50.*

Carefully planned, well written, profusely and competently illustrated, this book is a must for executives, engineers and designers having to do with resistance welding equipment.

Following a simple, lucid, but scientifically accurate description of the resistance-welding process, how and why it works, and the various forms it takes, the author proceeds to compare resistance welding with other joining methods, and shows the economies to be achieved by it. Succeeding chapters are devoted to standard, portable and special-purpose equipment. In a following chapter the author points out the importance of designing products for welding, rather than attempting to weld already designed products, and gives more than a hundred specific,

illustrated examples of this point.

Other chapters deal with design considerations for resistance welding, including spot, projection, seam and flash butt. Weld quality is discussed at some length, and various testing and evaluation methods are explained. Tooling, handling and material control are also dealt with. The closing chapters give valuable information on how to get the most out of the equipment, and helpful hints for reducing production time, and saving money, time, and wear and tear.

Extracts from the two final chapters have already appeared as articles in *American Machinist* and have met with a most favorable response from readers. The book itself merits careful attention and is the most readable, most understandable, and most practical work on the subject that it has ever been this reviewer's pleasure to encounter.

•

RECOMMENDED PRACTICES FOR SALVAGING AUTOMOTIVE GRAY IRON CASTINGS BY WELDING. *By Automotive Welding Committee. Published by American Welding Society, 33 W. 39th St., New York 18, N. Y. 19 pages. 6 x 9. Price $0.50.*

To meet the need for information on the best method of repairing specific defects in gray-iron castings, this booklet has been prepared as a tentative standard. Although, it describes the methods used for automotive repairs, the information is equally helpful as a guide for repairing other types of castings. Information is provided on oxyacetylene and shielded-arc welding with and without pre-heat and stress relief, braze-welding, brazing, soft soldering, metallizing and the use of mechanical methods. Typical defects and their repair are illustrated by photographs.

•

ENGINEERING ECONOMIC ANALYSIS (SECOND EDITION)—*By Clarence E. Bullinger, professor of industrial engineering, Penna. State College, State College, Penna. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 397 pages. Price $4.*

In the second edition of this basic text on the economic phase of engineering projects, the author has revised the sequence of several chapters to assist the student in obtaining a better understanding of topics such as intangible factors, endowment principles, and replacement prob-

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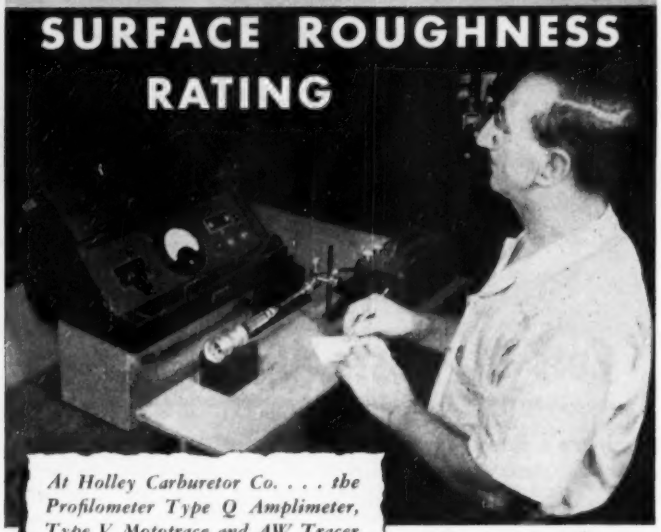

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lems. As in the previous edition, the author breaks his subject into three major sections: the economy analysis, which deals with the worthwhileness of the project in terms of return on investment; the financial analysis, which takes up the problem of providing funds; and the intangible analysis, which discusses factors that are evaluated largely by human judgment. Also explained are break-even charts, the economies of power generation and use, endowment principles, interest, and replacement.

•

PRINCIPLES OF ENGINEERING ECONOMY *(3rd Edition) — By Eugene L. Grant, professor of economics of engineering, Stanford University. Published by the Ronald Press Company, 15 E. 26th St., New York 10, N. Y. 623 pages. Price $5.*

Added material in this edition includes: the treatment of prospective price changes in economy studies designed to answer the basic question in all engineering projects, "Will it pay?"; the principles for considering income taxes in economy studies; and the theoretical aspects of replacement economy in the light of Terborgh's recent work in this field. In addition, more than two-thirds of the book has been rewritten to increase its usefulness both as a student text and as a reference book for the practicing engineer.

•

WAGE AND SALARY FUNDAMENTALS AND PROCEDURES—*By Lionel B. Michael, adjunct associate professor of management, Graduate School of Business Administration, New York University. Published by the McGraw-Hill Book Company, 330 W. 42nd St., New York 18, N. Y. 330 pages. Price $4.50*

Another in the McGraw-Hill Industrial Organization and Management Series, this text provides an easy-to-understand description of the entire field of wage and salary administration. It is not intended as a manual of application but rather to convey an appreciation of current management techniques in their relation to wage and salary problems. The author points out that there is no one answer to all problems and for each commonly encountered situation explains several methods that are applicable under given circumstances.

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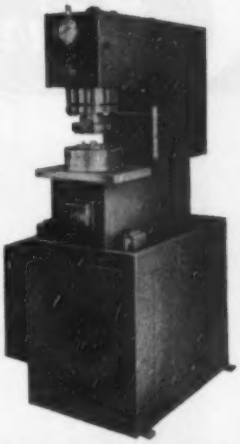

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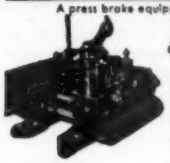

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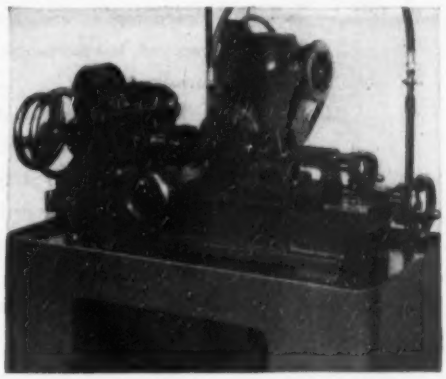

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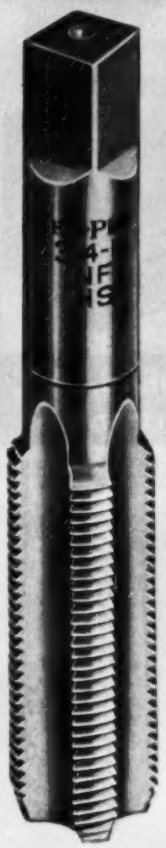

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FASTENERS DATA BOOK. *208 pages. Published by the Industrial Fasteners Institute. 3648 Euclid Ave., Cleveland 15, Ohio. Price $375.*

For years, the publication *"Fasteners"*, published by the above Institute (formerly, the American Institute of Bolt, Nut and Rivet Mfrs) has furnished industry with authentic articles on the engineering and application of the indicated fasteners, plus special headed and threaded products. Constant requests for copies of specific reprints has prompted the Institute to bring out this book, which is a compilation of full-length articles. Many of these articles report extensive research by industrial and technical organizations. The book will be helpful to those who select and apply fasteners.

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MANAGEMENT OF INDUSTRIAL RESEARCH — *A Selected and Annotated Bibliography. Published by Arthur D. Little, Inc., Cambridge 42, Mass., 18 pages, Free.*

Included in this bibliography are 96 references covering *organization* for research, procedures for the *control* of expenditures to assist in the evaluation of results, design of the research *program*, and the *research laboratory* with its problems of arrangement and construction.

•

WELDING PATENT CLASSIFICATION IN THE A. F. DAVIS WELDING LIBRARY —*By Robert S. Green. Published by Engineering Experiment Station, Ohio State University, Columbus, Ohio. 74 pages. 6 x 9. Price $0.75.*

Designed to make the Davis library of welding patents of greater value to students and industry, this classification makes it possible to sort out not only the fundamental patents on welding processes, but also the patents on the industrial applications of welding. In addition to the actual classifications, the booklet explains how the system is operated by notched cards, and gives specific examples of search problems.

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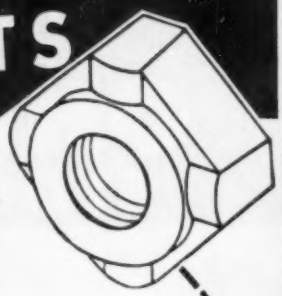

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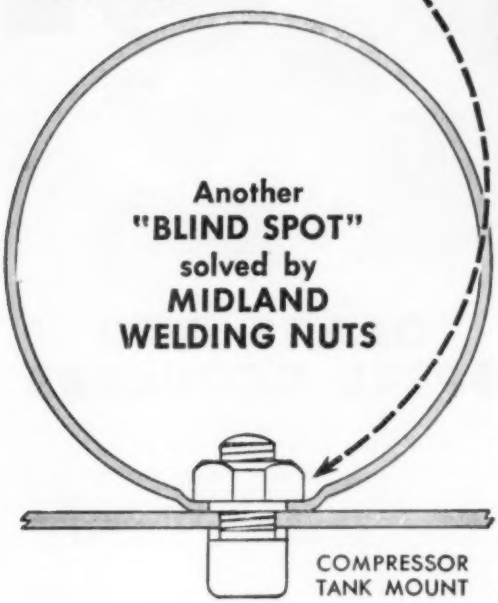

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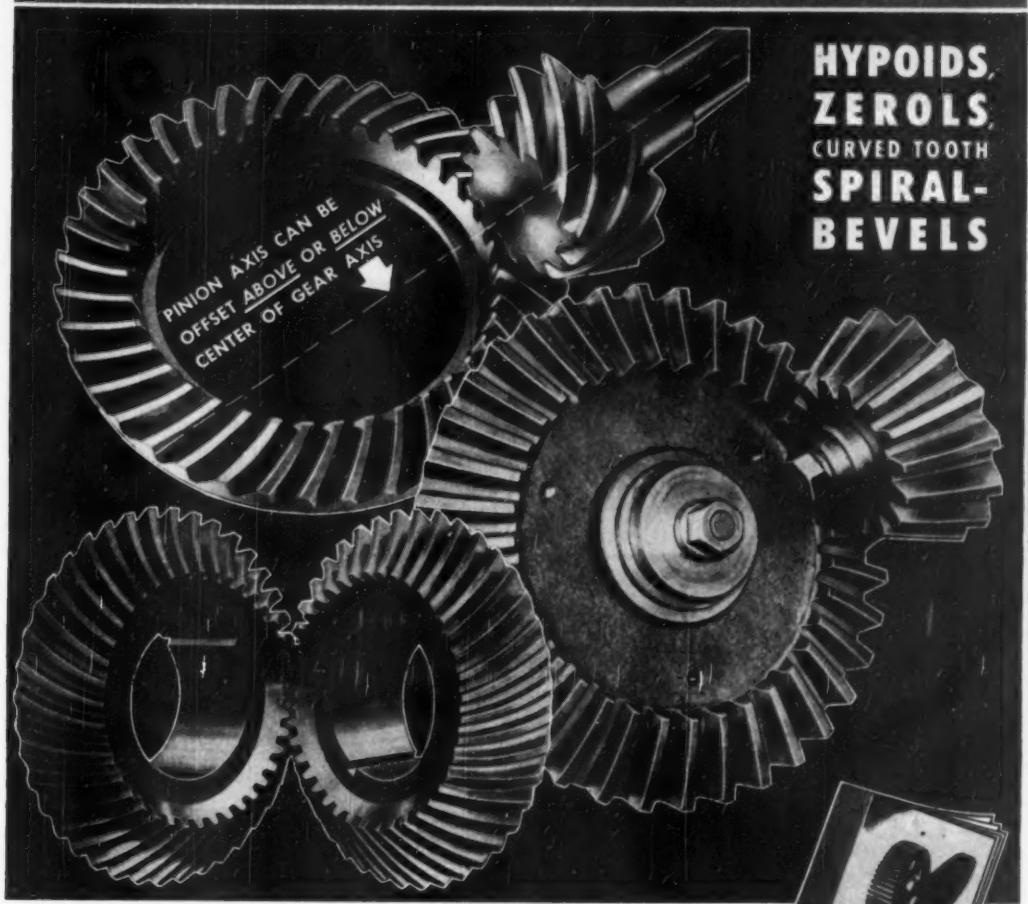
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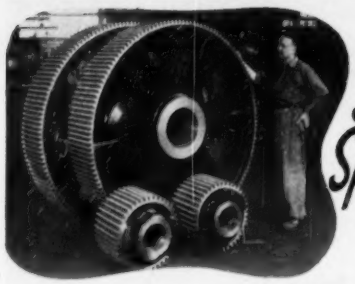

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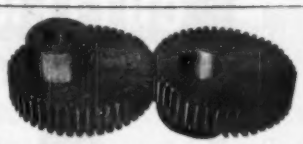

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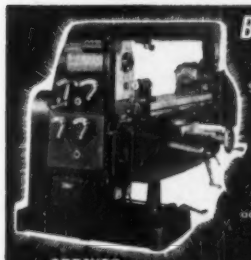

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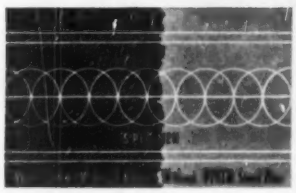

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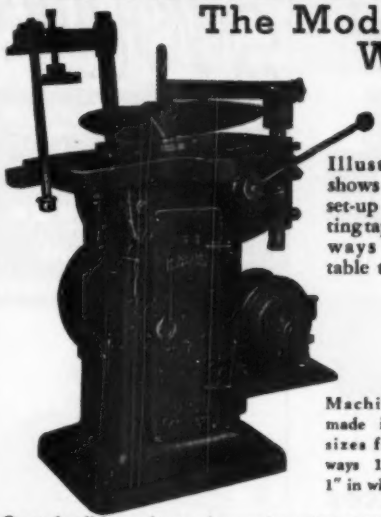

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

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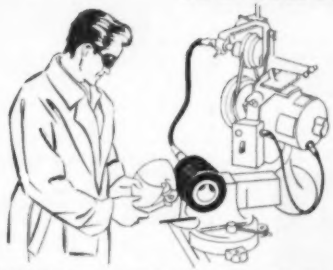

THE WHEEL WITH THE PNEUMATIC DRUM

With this Nu-Matic wheel the abrasive belt rides on a cushion of air contained in a rubber drum. Different pressures in the drum and different grits provide varied surface finishes. Deflate, and belts can be changed easily and quickly for grinding, sanding or polishing. Cut your labor, production and inventory costs with Nu-Matic grinding units. Adapters for ⅝"-11 or ½"-13 power equipment. (Specify size.)

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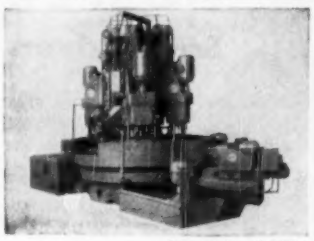
When you need high production with low unit and maintenance costs, consider the advantages of Roto-Matics. In this case the Roto-Matic is a station-type machine with indexing table. Drilling and reaming both suspension and king pin holes in front suspension support arms are performed at the rate of 83 pairs or 166 pieces per hour



General view of drilling and reaming machine equipped with new Roto-Matic mechanical power heads.

An outstanding new Davis and Thompson development incorporated in the design of this machine are the Roto-Matic mechanical, electrical power heads operated by screw feeds. Included among the safety features are overload release clutches on the feed screws. Six heads are used, three vertical and three horizontal. Lower maintenance costs are obtained through elimination of excessive servicing.

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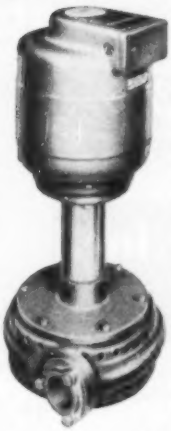

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in one continuous motion
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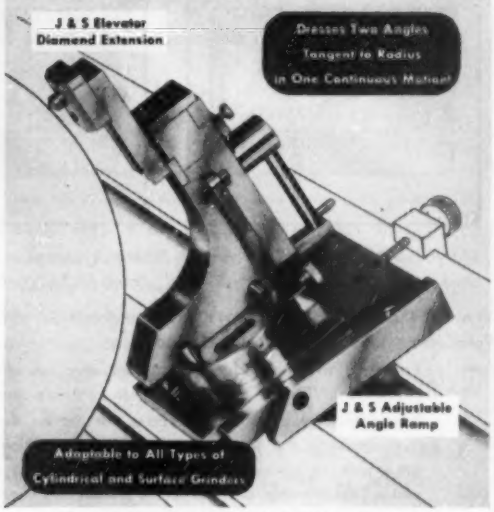
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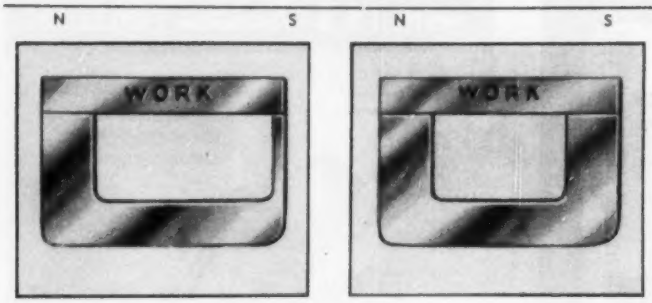

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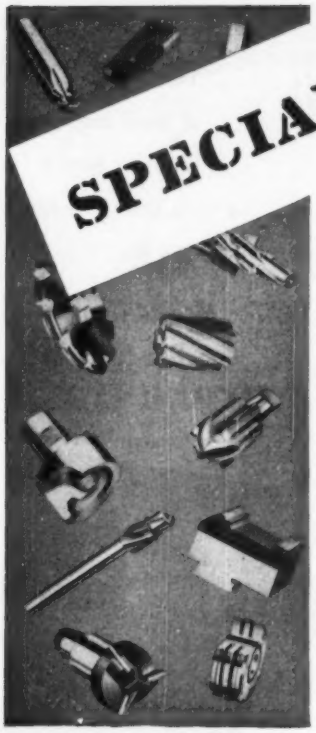
WHEN you report on anything, keep it brief. Supply details only when they're asked for. If the recipient wants more information, he'll ask. If you give him too much, he'll probably never read it in the first place.

KIDS enjoy surprises; grownups rarely do. Hence, keep those above you informed of what you're doing. Don't let your boss be in the embarrassing position of not knowing what's going on in his department—unless you're out to cut his throat. If you are, watch yours.



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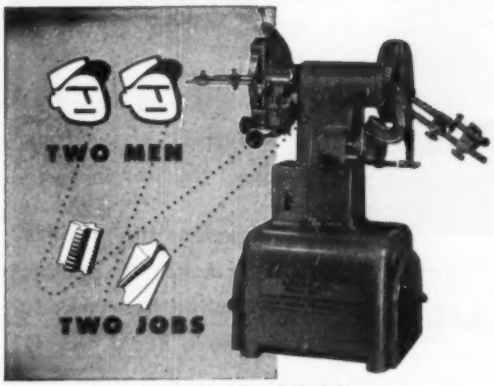

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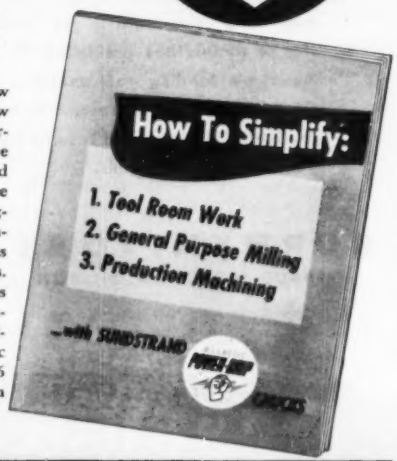

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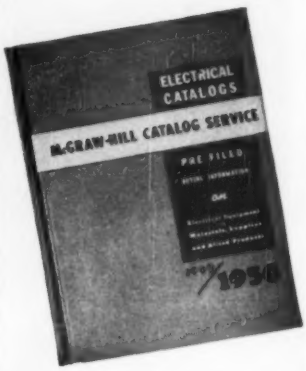

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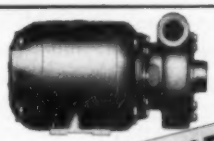

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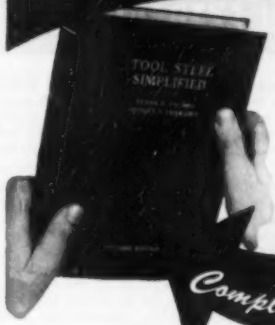

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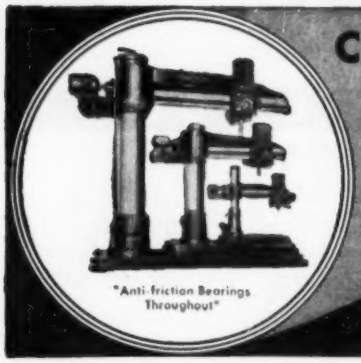

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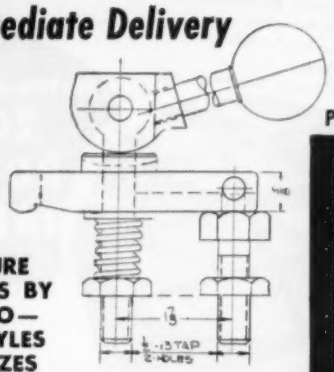

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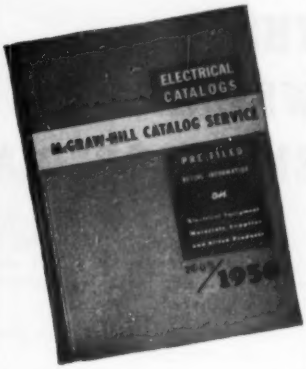

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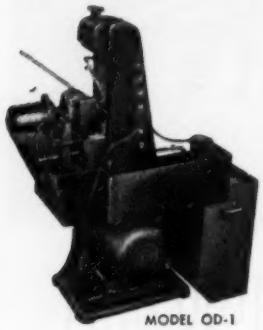

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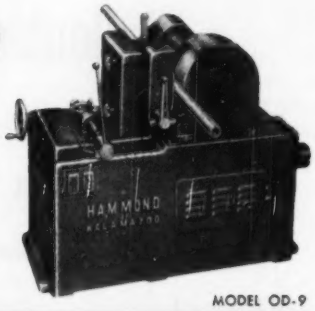

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Machinery (except electrical)	17,906
Electrical Machinery	3,973
Transportation Equipment	3,711
Instruments and Related Products	2,599

In 1947, these plants employed 4,731,820 people . . . industry's largest labor force. Of these people, 4,321,684 worked for the 10,151 plants that employ 50 or more workers each.

Metalworking is big . . . active . . . growing. And *American Machinist* is the metalworking magazine more metalworking men read than any other. They read this magazine because its editorial and advertising pages are their most useful and diverse source of information on the production methods and equipment through which Metalworking can keep on growing . . . and doing a better job of serving its customers.

American Machinist

The McGraw-Hill Magazine of Metalworking Production

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From the *American Machinist* Library of *Tips for Top Shop Men*

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SUPERIOR people are uncommon. It's your job to take average people and get them to do superior work.

TELL your men what the company is doing—but beware of telling too much. The things most people want to know about are none of their business.

AN OPEN mind is an asset only if it can be closed for action after the whole question has been considered and a decision made.

EXPECT men to have complaints. It's human nature, and besides, reforms come only from below. No man with four aces yells for a new deal.

AN OLD country saying is "Them that can brag *without lying*—let 'em brag." Remember the "lying" part particularly.

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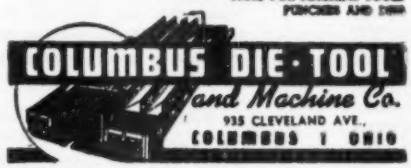

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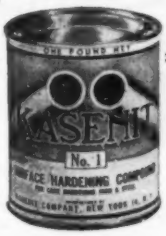

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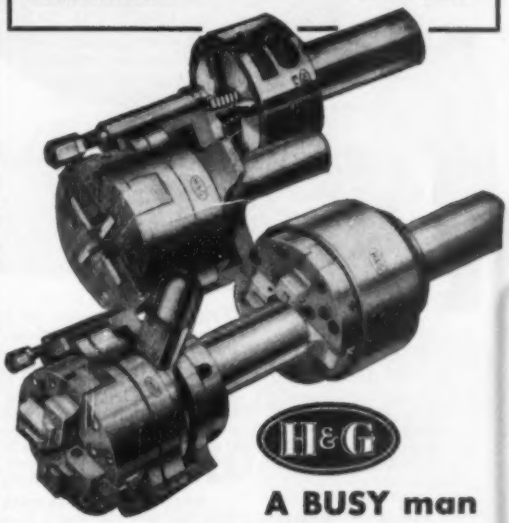

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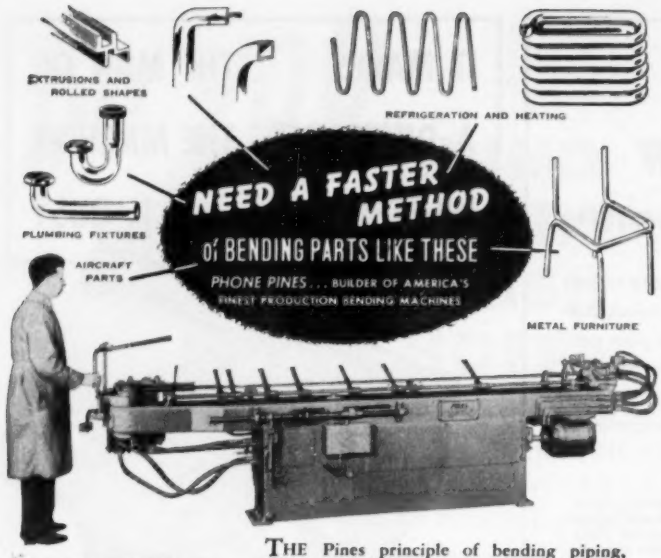

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For your copies of these reports, write Reader Service Department at address below. And don't forget to read the materials handling advertising which appears regularly in *American Machinist's* pages. It keeps you up-to-date on the best and newest materials handling equipment now available from America's leading manufacturers of it.

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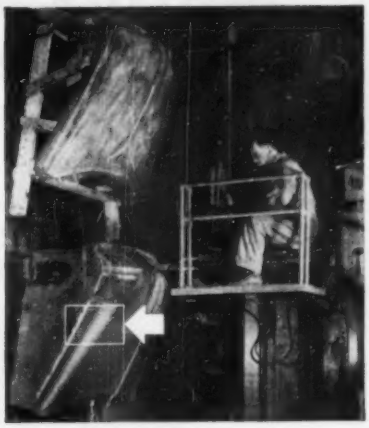

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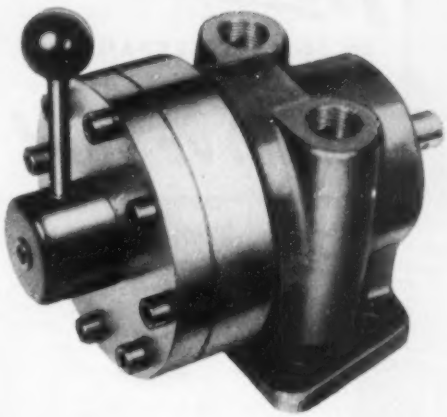

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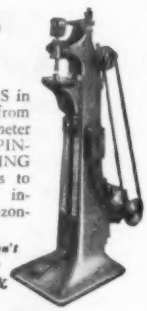

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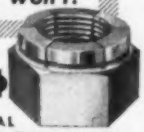
A fastener AIN'T, *if* — *it works loose.*

The "FLEXLOC" IS — *because it won't!*



FLEXLOC

ONE-PIECE, ALL-METAL

STOP- and LOCK-NUT

Its "chuck-like", resilient locking segments lock the "FLEXLOC" securely in any position on a threaded member with a controlled, uniform and dependable torque.

Tough applications demonstrate that the "FLEXLOC" positively "won't work loose", yet it can be removed easily with a wrench when desired. Because it is all-metal, temperatures as high as 550°F. hold no terrors for the "FLEXLOC".

The "FLEXLOC" has plenty of tensile . . . can be re-used many times . . . has therefore a long, effective life.

Write for further information and free samples.

See us at Booth 2434, Convention of National Metal Congress and Exposition, Chicago, October 23 to 27.

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...at the flip of a single page

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All three styles of Bokum Boring Tools have combined helical and spiral relief that give these advantages over ordinary boring tools:

—constant clearance throughout life of tool.
—shape of cross section remains constant.
—easy resharpening by grinding top face only.
—available in wide range of sizes, 1/16" and up.

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K 1139-6 for super high steel
K A398 for carbide-tipped tools
K 948 for solid tungsten carbide
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SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

From The *American Machinist* Library of *Tips for Top Shop Men*

IT'S one thing to hate red tape and paper work, another to do without them. Some of each is necessary, the first to give people time to think, the second to protect you against people who can't.

REMEMBER that your employees' need for recognition is a *continuing* appetite—just the same as their need for food. A morsel once every six months won't satisfy either one.

USE YOUR METALWORKING ASSOCIATIONS

No matter what kind of problem you run up against in production, engineering, research, or management, the chances are 10 to 1 there's an association to handle it. There are associations for rabbit skinners, vitamin chemists, poultry publishers, municipal finance officers; not to mention associations concerned with shoe patterns exhibits, music, and caskets. If you're an especially bad driver, you might even manage to join an auto-wrecker association as an honorary member.

The following associations are of interest to most manufacturers in the metalworking field. Some are suppliers, others are advisory institutions; and almost all can provide specialized information when it is needed:

PROFESSIONAL SOCIETIES

American Assn. of Engineers;
8 S. Michigan Blvd., Chicago 3

American Institute of Chemical Engineers;
120 East 41st St., New York 17

American Institute of Consulting Engineers;
75 West St., New York 6

American Institute of Mining & Metallurgical Engineers;
29 West 39th St., New York 18

American Institute of Weights & Measures;
33 Rector St., New York 6

American Ordnance Assn.;
Mills Bldg., Washington, D. C.

American Railway Bridge & Building Assn.;
431 S. Dearborn St., Chicago 5

American Railway Engineering Assn.;
59 East Van Buren St., Chicago 5

American Society of Body Engineers;
100 Farnsworth Ave., Detroit 2

American Society of Heating & Ventilating Engineers;
51 Madison Ave., New York 10

American Society of Lubricating Engineers;
343 South Dearborn St., Chicago 4

American Society of Mechanical Engineers;
29 West 39th St., New York 18

American Society of Safety Engineers Engineers;
40 West 40th St., New York 18

American Soicety of Safety Engineers;
20 N. Wacker Drive, Chicago 6

American Society of Sanitary Engineering;
1308 Freemont St., McKeesport

American Society for Testing Materials;
1916 Race St., Philadelphia 3

American Society of Tool Engineers;
10700 Puritan Ave., Detroit 21

American Standards Assn.;
70 East 45th St., New York 17

Association of Iron & Steel Engineers;
1010 Empire Bldg., Pittsburgh 22

Illuminating Engineering Society;
51 Madison Ave., New York 10

Instrument Society of America;
921 Ridge Ave., Pittsburgh 12

National Society of Professional Engineers;
1121 15th St., Washington 5, D. C.

PROCESSES

Alloy **Casting** Institute;
39 Broadway, New York 6

American Foundrymen's Assn.;
222 West Adams St., Chicago 6

National Founders Assn.;
120 South La Salle St., Chicago 3

American **Hot Dip** Galvanizers Assn.;
First National Bank Bldg., Pittsburgh 22

American **Electroplaters** Society;
P. O. Box 168, Jenkintown, Pa.

Electrochemical Society;
235 West 102nd St., New York 25

Drop Forging Assn.;
Hanna Bldg., Cleveland 15

Forging Mfrs. Assn.;
366 Madison Ave., New York 17

National Assn. of Metal **Finishers**;
Dime Bldg., Detroit 26

Packaging Institute;
342 Madison Ave., New York 17

National Spray **Painting** & Finishing Assn.;
300 Phillips Ave., Toledo 12

Pressed Metal Institute;
13210 Shaker Square, Cleveland 20

National **Screw** Machine Products Assn.;
13210 Shaker Square, Cleveland 20

National **Metal Spinners Assn.**;
186 Joralemon St., Brooklyn 2

Metal **Stamping** Research Institute;
327 Lexington Ave., New York 17

Metal **Treating** Institute;
420 Lexington Ave., New York 17

American **Welding** Society;
29 West 39th St., New York 18

Resistance **Welders** Mfrs. Assn.;
505 Arch St., Philadelphia 6

METALS

Aluminum Assn.;
420 Lexington Ave., New York 17

Aluminum Research Institute;
20 N Wacker Drive, Chicago 6

Brass & Bronze Ingot Institute;
308 W Washington St., Chicago 6

Brass Forging Assn.;
420 Lexington Ave., New York 17

Copper & Brass Research Assn.;
420 Lexington Ave., New York 17

Copper Institute;
50 Broadway, New York 4

American **Iron & Steel** Institute;
350 5th Ave., New York 1

Gray Iron Founders Society;
210 National City, E 6th Bldg., Cleveland 14

Magnesium Assn.;
122 E. 42nd St., New York 17

Metal Powder Assn.;
420 Lexington Ave., New York 17

Non-Ferrous Founders Society;
127 N Dearborn St., Chicago 2

American **Steel** Warehouse Assn.,
Terminal Tower, Cleveland 13

Steel Founders Society of America;
920 Midland Bldg., Cleveland 15

American **Tin** Trade Assn.;
75 West St., New York 6

American **Zinc** Institute;
60 E 42nd St., New York 17

American Society for **Metals**;
7301 Euclid Ave., Cleveland 3

National Metal Congress;
7301 Euclid Ave., Cleveland 3

TOOLS AND MACHINES

Broaching Tool Institute;
74 Trinity Pl., New York 6

Cutting Die Institute;
1643 National Bank Bldg., Detroit 26

Diamond **Core Drill** Mfrs. Assn.;
90 West St., New York 6

Machine **Knife** Assn.; Wabash, Ind.

Hack Saw Mfrs. Assn. of America;
50 Broadway, New York 4

Mfrs. of Hard Edge, Flexible Back; Metal Cutting **Band Saws**;
50 Broadway, New York 4

Machinists **Vise** Assn.;
c/o Desmond Stephan Mfrs. Co., Urbana, Ohio

Cutting Tool Mfrs. Assn.;
777 Penobscot Bldg., Detroit 26

Electric Tool Institute;
Clark Bldg., Pittsburgh 22

Forged Tool Society;
Law & Finance Bldg., Pittsburgh 19

Metal Cutting Tool Institute;
405 Lexington Ave., New York 17

National Tool & Die Mfrs.;
Union Commerce Bldg., Cleveland 14

Service Tools Institute;
53 Park Pl., New York 7

American Machine & Parts Assn.;
910 17th St., Washington 6, D. C.

American Machine Tool Distributors Assn.;
505 Arch St., Philadelphia 6

American Supply & Machinery Mfrs. Assn.;
Clark Bldg., Pittsburgh 22

Mechanical Press Builders Assn.;
425 Elliott Square Bldg., Buffalo 3

Machinery & Allied Products Institute;
120 South La Salle St., Chicago 3

National Machine Tool Builders Assn.;
10525 Carnegie Ave., Cleveland 6

National Supply & Machinery Distributors Assn.;
505 Arch St., Philadelphia 6

Packaging Machinery Mfrs. Institute;
342 Madison Ave., New York 17

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Electric Overhead **Crane** Institute;
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Hand **Chain Hoist** Institute;
208 South La Salle St., Chicago 4

Electric **Hoist** Mfrs. Assn.;
71 West 35th St., New York 1

Monorail Mfrs. Assn.;
71 West 35th St., New York 1

Electric Industrial **Truck** Assn.;
29-28 41st Ave., Queens Plaza, L. I. 1

Assn. of Lift **Truck** & Portable Elevator Mfrs.;
P. O. Box 66, Medfield, Mass.

Material Handling Institute;
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COMPONENTS AND SUPPLIES

Compressed **Air** & Gas Institute;
90 West St., New York 6

Automotive & Aviation Parts Mfrs.;
800 Michigan Bldg., Detroit 26

Automotive Electric Assn.;
Michigan Bldg., Detroit 26

Assn. of American **Battery** Mfrs.;
First National Tower Bldg., Akron 8

Anti-Friction **Bearing** Mfrs. Assn.;
60 East 42nd St., New York 17

METALWORKING ASSOCIATIONS

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Chain Institute;
208 South LaSalle St., Chicago 4

Assn. of Roller & Silent **Chain** Mfrs.;
7601 Central Ave., Detroit 8

Assn. of Sprocket **Chain** Mfrs.;
11 South La Salle St., Chicago 3

Malleable **Chain** Mfrs. Institute;
11 South La Salle St., Chicago 3

American **Die Casting** Institute;
366 Madison Ave., New York 17

National **Electrical** Mfrs. Assn.;
155 East 44th St., New York 17

Electric **Fuse** Mfrs. Guild;
53 Park Pl., New York 7

American **Gear** Mfrs. Assn.;
Empire Bldg., Pittsburgh 22

Grinding Wheel Institute;
27 Elm St., Worcester

Metal **Abrasive** Council;
Engineers Bldg., Cleveland 14

American **Petroleum** Institute;
50 West 50th St., New York 20

Cast Iron **Pipe** Research Assn.;
122 South Michigan Ave., Chicago 3

Tubular & Split **Rivet** Council;
53 Park Pl., New York 7

Sheet Metal **Screw** Statistical Service;
53 Park Pl., New York 7

United States **Cap Screw** Service Bureau;
53 Park Pl., New York 7

Leaf **Spring** Institute;
3105 East Grand Blvd., Detroit 2

Spring Mfrs. Assn.;
249 Main St., Bristol, Conn.

Assn. of **Steel** Distributors;
150 Broadway, New York 7

Steel Products Warehouse Assn.;
Union Commerce Bldg., Cleveland 14

Formed **Steel Tube** Institute;
Keith Bldg., Cleveland 15

Seamless Steel **Tube** Institute;
1115 Gulf Bldg., Pittsburgh 19

Copper **Wire** Engineering Assn.;
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Multiple **V-Belt** Drive & Mechanical Power Transmission Assn.;
7 West Madison St., Chicago 2

Valve Mfrs. Assn.;
60 East 42nd St., New York 17

Spring **Washer** Institute;
74 Trinity Pl., New York 6

American **Weldment** Mfrs. Assn.;
332 South Michigan Ave., Chicago 4

National **Welding** Supply Assn.;
505 Arch St., Philadelphia

Seamless **Tube** Institute;
1115 Gulf Bldg., Pittsburgh 19

Copper **Wire** Engineering Assn.;
1401 K St., Washington 5, D. C.

MISCELLANEOUS

American Bureau of Metal Statistics;
33 Rector St., New York 6

Assn. of Consulting Management Engineers;
347 Madison Ave., New York 17

Automobile Mfrs. Assn.;
New Center Bldg., Detroit 2

Automotive Safety Foundation;
Hill Bldg., Washington 6, D. C.

Hydraulic Institute;
90 West St., New York 6

Fluorescent Lighting Assn.;
14 Reade St., New York 7

Incandescent Lamp Mfrs. Assn.;
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He's reading an advertisement in THIS magazine! He has his eye on a product that promises the answer to a brand new problem he's been sweating over.

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YOU'LL BE SURPRISED!

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They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

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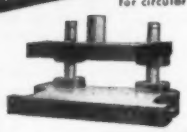

Being originators of Standard Die Sets naturally we are steps ahead in Design—Precision—Dependability and Economy. Because Baumbach Die Sets have demountable Leader Pins and Bushings, Die Set inventory is reduced as well as costly machining time. Learn about Baumbach superiority before you buy.

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Special Machinery

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How to read with your eyes open for business!

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off—by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

F-24

PRODUCTION goes up

SPOILAGE goes down

—with this Procunier High Speed Tap Head

Today you must *speed up* your *production* schedules . . . and at the same time *reduce spoilage!* The Procunier High Speed Tapping Head is precision-built for faster, consistently accurate production tapping. A host of exclusive Procunier features enable you to maintain cleaner, sharper threads . . . with fewer broken taps, fewer spoiled pieces—even on accelerated production runs.

HERE'S WHY: Tap driving pressure is *automatically regulated* by the amount of pressure applied to the unique Procunier friction clutch. Operators quickly learn to detect dull or "loaded" taps just by the pressure needed to drive them! This increased sensitivity enables even "green" operators to do more accurate tapping. "Blind" hole tapping may be done as easily as through tapping! WRITE TODAY for brochure giving full details and specifications on Procunier High Speed Tap Heads.

Also Available—

NEW! Procunier "TAP KING" for large hole tapping. Capacity ⅜" to 1" in steel; 1⅛" in softer metals.

Exclusive! PROCUNIER "Tap Saver"

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

Prompt Delivery

Procunier

Safety Chuck Company

14-18 S. Clinton St., Chicago 6, Illinois

PROCUNIER SAFETY CHUCK CO.
14-18 S. Clinton St., Chicago 6, Ill., Dept. 9

Gentlemen:

Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

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Address _____

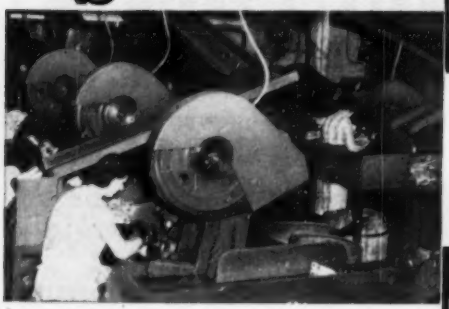
City _____ Zone _____ State _____

From The *American Machinist* Library of *Tips for Top Shop Men*

THE man who can't keep regular hours or follow regular habits may be too expensive to keep, regardless of his ability. His effect on morale may be more costly than his extra value as an individual.

EVEN when you are sure your solution to a problem will work, have an extra one ready, just in case. You'll be surprised how many men are caught napping by the failure of "sure-fire" solutions.

Started with one...



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POWER PRESS

...now they have
50
IN OPERATION!

PRESS-RITE
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THE ABOVE PHOTO ILLUSTRATES how one large manufacturer in Detroit turned to Press-Rite Power Presses for maximum production. Their satisfaction and enthusiasm is due to outstanding Press-Rite features.

SEE THE
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POWER PRESSES
BOOTH 1720
NATIONAL METAL
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CHICAGO — OCT. 23-27

YOU'LL LIKE THESE PRESS-RITE FEATURES TOO!

- Non-repeat single stroke safety mechanism.
- Automatic cam actuated brake.
- Four point sliding key clutch.
- Roller and ball bearings throughout.
- Extra strong uni-cast frame of special alloy. (Extra tie rods in the New 85 ton Press-Rite Press.)

Send for Illustrated Catalogue Today

Sales Service Machine Tool Co.
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ST. PAUL 4, MINNESOTA

From The *American Machinist* Library of *Tips for Top Shop Men*

YOU can step up interest in company headaches by skits in which employees do the acting. Shop problems can be dramatized with topics selected by the players. Not only does the message go over better but the actors are happier on their jobs.

BEWARE of being too frank. If you always call a spade a spade, it's difficult to avoid giving somebody a dirty dig.

DON'T have too much respect for the man who takes his time, because he's taking your time too.

Here's Why it Pays You to Read the Advertising

The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services — quickly available to you — just for the reading.

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When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

F-25

A straighter line than you can draw . . .

is what you get when light passes through optical glass. This property makes light energy your best source of extremely accurate measurement in precision work, gaging, and inspection.

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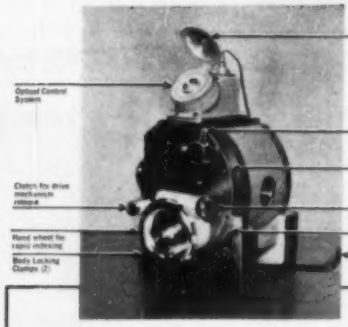
American Machinist

Reader Service Department

McGraw-Hill Building, New York 18



OPL Dividing Head *insures* Positive Accuracy of Indexing

OPL DIVIDING HEAD is designed by F. T. Griswold Mfg. Co. expressly for use on machine tools—its purpose to permit the operator of a milling machine, jig borer, or drill press to index his work with *speed* and *accuracy* not possible with mechanical type heads.

OPL insures positive accuracy of indexing by eliminating gears, sliding pins and perforated index plates necessary for mechanically controlled dividing heads.

Reduce the chance of error with OPL. Accurate—dependable — durable. Write today for full details.

F. T. GRISWOLD MFG. CO.
WAYNE • PENNA.

JOSEPH M. COOK ***AND STAFF***
• • INDUSTRIAL ENGINEERS • •

Specialists in economical metal removal on machining operations.

May we discuss with you our approach to this problem?

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NEW JERSEY Manufacturer requires sales representatives, having following among machine designers, to carry line of ball and roller bearing accessories on commission basis. State full particulars, first letter. RW-7557, American Machinist.

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SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment servce. 40 years recognzed standng and reputaton. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y

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MECHANICAL ENGINEER with shop and sales experience has $20,000 to invest in going business; with services. BO-7413, American Machinist.

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Manufacturing Engineers

Western Germany. Machine tools and textile machinery are looking for new series productions for export, proposals to Letzerich K. G. Rheydt., Germany.

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Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys, Suite 453, 815 15th Street, N.W., Washington 5, D.C.

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P-7477, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

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Graduate mechanical engineer or equivalent with thorough knowledge of both tool and machine design wanted by large textile machinery manufacturer located in eastern Pennsylvania.

P-7318, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

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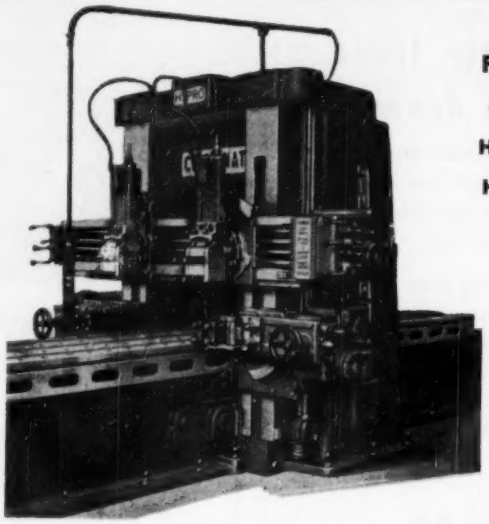
WANTED BY MICHIGAN MANUFACTURER

Must be free to travel midwest territory. Change of address will be required. Supply full history and salary required when replying. Excellent opportunity offered by a leading drill manufacturer. Reply to 1166 Penobscot Bldg., Detroit 26, Mich.



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48"x24"x20' Cincinnati HYPRO New Style Extra Heavy Frog and Switch Planer.

2 off-set rail heads, arranged for 75/125 H.P. Variable Voltage Reversing Planer Drive, complete with 75 KW Motor Generator Set. 1948 machine.

36"x36"x16' Cincinnati Hypro Double Housing Planer. Two rail heads and two side heads. Complete, including 25/50 H.P. variable voltage drive operative on 220 volt, 3 phase, 60 cycle A.C. Variable cut and return speed range from 8 to 240 ft. per minute. New 1944. Condition equal to new. Shipment same day order is received.

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MElrose 1241
CABLE ADDRESS
EMCO

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27"-30"x84" Monarch Geared Head & Engine Lathe, T.A., M.D. (1942)

No. 14 Buffalo Steel Billet Shear, 5½" round capacity.

No. 10 Buffalo Steel Bar Cutter, 3½" round capacity.

No. 60 Cameron Rotary Cap Thread Roller, M.D.

12"x12" Type DA Dings Magnetic Chip Separator.

No. 40-5 Minster S.S.—D.B.G. Press, 16" stroke.

No. 4 LaPointe Broach, 50 ton capacity.

50 Ton Henry & Wright Dieing Machine.

10"x18" Cincinnati Model EA Grinder, serial #SP2A1L-13.

No. 5-60 Cincinnati Hydromatic Production Mill.

No. 5 Leahbough Jordan B.G.—O.B.I. Punch Press, M.D., 4½" stroke.

1½" Conomatic Automatic Screw Machines, late. (3)

No. 2G Brown & Sharpe H.S. Aut. Screw Machine, serial #10815, 1¼" cap.

20" Ohio Shaper (1943)

No. 3¾ Bliss S.S. Toggle Press

No. 6 Bliss S.S. Tie Rod

No. 174 Toledo Tie Rod Toggle Press

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TELEPHONE TAylor 9-8200
LAKE MACHINERY COMPANY
942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

NEW KNUCKLE JOINT PRESSES

Never Used

2 No. 238 Bliss single geared Presses, 6 inch stroke, V-belt drive, with electrical equipment. Friction clutch. Immediate delivery.

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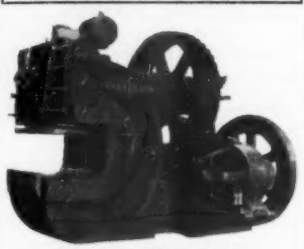

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CAPACITY 750 TONS

PUNCH 6" THRU 1⅛"
SHEAR 8"x8"x1½" ANGLES
MOTOR DRIVEN
EXCELLENT CONDITION

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Chicago, Illinois
HUdson 3-5400

AARON FOR ONE OF THE LARGEST STOCKS OF MODERN MACHINERY AT LOWEST PRICES—MONEY BACK GUARANTEES

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Cone 4 Sp. 1¼" Autos.
Fay Automatic, 12"x81".
L&S Duomatic 2A

BORING MILLS
Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz.
Heald #49 double spindle, #48A Borematics
Universal 3" horiz. equipped.
Bullard 24", 36", 42" VTL
King 72", 42" vertical

DRILLS AND RADIALS
Barnes No. 242, No. 5 Morse
Carlton 8'-19" column
Canedy-Otto 3'-9" col.
Cinci-Bickford 21" Box Col. S. S.
Sibley 24"-28", Power Feeds
Hamilton, Langelier, Hi-Speed.

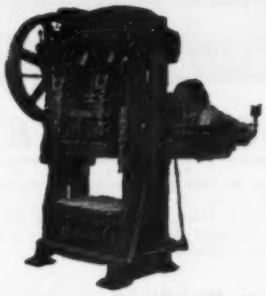
ENGRAVERS
Gorton No. 8U
Deckel GIL, G2, 2 dimen.
Gorton Cutter Grinders 375-2, 265-6.

GEAR EQUIPMENT
Fellows #7, 72, 712, 725, 7125, High Speed.
Fellows 645Y Spur & Spiral
Gleason #2 Surface Hardener.
Gleason 3" Spur Bevel Generator
Michigan, Gleason, Fellows Checkers.
Mikron Gear Hobber.

GRINDERS, MISCELANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18", 3" x 12".
B. & S. Nos. 1, 2, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Bryant #16 Internal
Cinn. 12 x 48" Filmatic Univ. 12 x 36"
Cinn. #2 Univ. Tool & Cutter
Covel No. 91A Univ. T. & C.
Dalsen Thread, latest
Gardner #226, 30" Disc.
Hanchett #228 Disc. Dbl. opposed w. M.D. Feed.
Heald 72AS Sizematic Int. Centerless, 81 Internal. 72AS Sizematic —gaugematic
K.O. Lee Tool & Cutter.
Landis, 10x24" type C Univ., 10x36" angu., centreless
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 4G Drill Grinder
Wickman Profile

GRINDERS, SURFACE
Abrasive No. 83, 34 Vert. 8x24.
Blanchard No. 11, 16" Mag. Chuck.
Blanchard #16A—30" Chuck
Blanchard #18-30" Chuck
Brown & Sharpe #5, 8x24"
G & L Hyd. #25, 6x18", #35, 8x24", #45, 12x24".
Hanchett Model 300, 13 x 48".
Heald #25A Rot. Surf 16" hyd.
Norton 6x18", and 10x36" Hyd.
Reid No. 2A F.F. MIB.
Reid No. 2C Motor Spdl. Hand Feed.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'
Hardinge Precision, 1" Collet Cap.
Hendey 12" x 42" GH.



Bliss Double Crank Toggle Press No. 406—48"

Bliss #3½A Toggle Pfess Geared, 1½ Toggle
Bliss No. 304A, 306, 78½ (330 Ton) Straight Side Presses.
Bliss 645B, 650 High Production Presses.
Henry & Wright 75 Ton Dieing Press.

HYDRAULIC PRESSES

DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	68½"	35 x 36
H.P.M. Double Action	500	24"	30"	36 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24" bed.
Denison	25/50	18"	23"	22 x 20
Hannifin	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	9"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	68½"	42 x 32

UP MOVING RAM PRESSES

Southwark	400	20"	27" to 48"	34 x 24
Waterbury Farrel	800	4½"	28"	22 x 24
Birdsboro	800	20"	30" to 48"	40 x 32
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
HPM	180	15"	14½"	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	4"	12"	18 x 18
Stewart Boling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES — 600 ton 96"
500 ton — 48"; 300 ton — 48.

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9"	2000
General Electric	18" x 11"	400
Watson Stillman (13 gal) Hydr. Pass.	42 x 9 x 48"	3000

Lodge & Shipley 20"x54" G.H. 24 Spindle Speed latest
Monarch 10"x20" KE
Monarch 12x30" Dble. Compound, 18", 12"x30" CKK
LeBlond Regal 10"x3½', 13"x24". 15"x30", 16"x48" T.A. 19"x48". T.A. 21"x60"
LeBlond Heavy duty 16"x30".
Lodge & Shipley 16 x 78" T.A., Collets, etc., 20"x54" 24 speed G.H.

Rivett 608 QCG, T.A., Precision
South Bend Q.C.G., 18"x8', 10"x4'

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21
Cincinnati No. 1-18, 2-18, Mfg., 50-96 hydromatic
Kent Owens IV
U. S. Multimiller, 1 & 2 Spindles.
Sundstrand 00 Rigidmills

MILLS, PLAIN AND UNIVERSAL
B. & S. No. 2A Univ.
Cincinnati No. 3 Plain, 2M Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain, 2 HL
Van Norman Duplex, 6, 20, 36.

MILLS, VERTICAL
Index, Jackson
Brown & Sharpe No. 2 Standard.
Cincinnati No. 4, Hi-Power.
Gorton No. 8D, 9-J Plain.
Morey No. 12M Profiler 2 sp.
Sipp MP5 Jig Borer
Fosdick #30 Jig Borer.
Pratt & Whitney #2 Jig Borer

PRESSES
Bliss No. 18, 19, 20, 21, OBI.
Bliss No. 304A, 4" Str. 22"x24" bed, #306 w. Air Cushion. S.S.
Bliss No. 645B, 650 Hi-Production, 58, 62, 62A, 162.
Bliss No. 4½ Double Action Cam
Colton Tablet Presses.
Gen. Flexible Screw Press.
Henry & Wright Dieing, 75 Ton.
Reliance 45 Ton, O.B.I.
Z. & H. 50 Ton, O.B.I.
Stokes Tablet Presses, Model R & T, DD2.
V&O #01

TURRET LATHES
Acme No. 6 W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1½" cap., No. 5, Chuck.
Brown & Sharpe 2F
Foster No. 3R.
Gisholt No. 4, Bar and Chuck, 2L, Saddle Type
Jones & Lamson #5 Univ. Preselector head, PRT
Warner & Swasey No. 4A 8" Cap.

MISCELLANEOUS
Band Saw; DoAll 36" Zephyr, Tannewits No. 36M.
Bending Roll: Webb ¼"x5', BR-3
Broach: American Horiz. Hyd. H-15-60.
Centering Machine: Sundstrand.
Comparator: J & L 14" pedestal & bench.
Hacksaw: Marvel Nos. 6 and 6A, 9A Automatic Feed.
Marking Machine: Noble & Westbrook
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Profilers: Cinn. 360° 4 Sp., Morey 12M
Shaper: 24" Rockford Hyd. Heavy Duty.
Cinn. 24" Universal.
Sheldon 12" Brand New.
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Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
Tapper: Bakewell #1, #2
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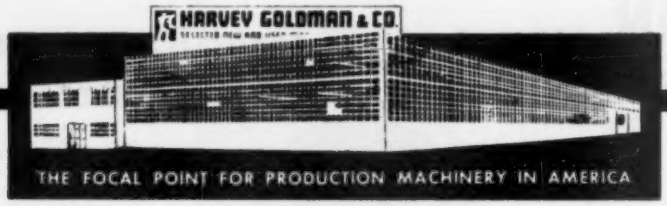

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This new, modern plant at 3900 Schaefer Highway and Maple Road, Dearborn, Michigan is the direct result of three generations of service to thousands of customers who have made Harvey Goldman & Co. their first and only source for the very finest in machine tools. Make Harvey Goldman & Co. the source for all your machine tool needs.

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- LATHES
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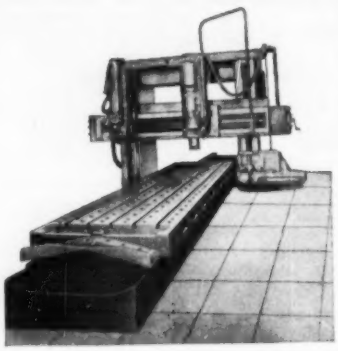
3900 SCHAEFER HIGHWAY • DEARBORN, MICHIGAN • TELEPHONE: TIFFANY 6-4450

Latest Type, built new 1941

GRAY 84"x52"x16' Planer Type Milling Machine Power rapid traverse; Distance between housings—85"; Distance under rail—52"; Length of table—16'; Width of table—15"; Diameter of quills 8½"—2 heads on cross rail; 1 side head; 18 spindle speeds 10 to 500 RPM; complete with motor and electrical starting equipment.



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W. F. & JOHN BARNES VERTICAL DRILLING & BORING MACHINE, 16 spindles driven from base. Original cost over $20,000.00. Practically new. Very late type.
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HIGH SPEED TOOL BITS

3/16" square x 2" long	$ .05 each	1/2" square x 4" long	.50 each
1/4" " x 2½" "	.10 "	5/8" " x 4½" "	.75 "
5/16" " x 2½" "	.15 "	3/4" " x 5" "	1.00 "
3/8" " x 3" "	.25 "	7/8" " x 6" "	1.25 "
7/16" " x 3½" "	.35 "	1" " x 7" "	1.50 "

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Potter & Johnston #4D Timken Head, A.C. M.D. Chucker
Heald No. 49 Borematic, 2 Spindle Hydraulic Cross Table
Fisher, 5" Bar Floor Type Horizontal Boring Mill, AC-DC Drive
Gorton 3L—Three Dimensional Pantograph with Cutter Grinder
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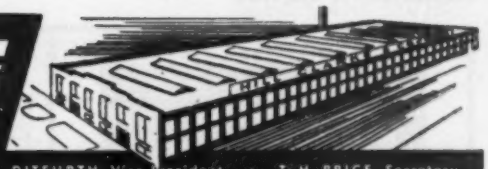

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No. 2G Brown & Sharpe Automatic
No. 6 Brown & Sharpe Automatic

DRILLS
No. 150 Baker
No. D9 Colburn, No. 6 Morse Taper
No. 300—36" Defiance #5 Taper (1943)
No. 4—B Edlund S.S. No. 3 Taper
No. 1-LMS Leland-Gifford (1942)
No. 2-LMS Leland-Gifford (1942)
No. 4SL Natco 36 Spdl. (1943)
3'-4'-10" col. American Radial

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 12 Gleason Bevel Gear Generator
72" Cincinnati Gear Cutter
No. 3 Barber-Colman Hob Sharpener

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
No. 32 Giddings & Lewis, 3½" Bar
No. 2 Lambert 4" bar
No. 48-B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1943)
24" Bullard
36" Bullard
42" Bullard New Era
60" Colburn, M.D.
72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
4"x18" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x96" Landis Type C hydraulic (1942)
Norton Motorized Grinders ranging from 6"x18" to 16"x96"
No. 5 Bryant Internal Grinder
No. 3 Abrasive Surface Gdr.
No. 34 Abrasive Surface Grinder (1943)
No. 11-16 Blanchard
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 16—36 Bryant Internal Gdr.

LATHES
18"x6' American, Gdr. Head, M.D.
18"x8' American Gd. Hd.
24"-27"x22' Lodge & Shipley
36"x16' Betts—Bridgeford Grd. Head
36"—48"x16' Lehman Hydratrol (1945)
8"x15" Sundstrand, Model B (1943)
10"x22" Sundstrand, Model AA (1943)
20" Fay Automatics (1942)
Model R-14 Seneca Falls Lo-Swing
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby, Bar Feed (1942)
No. 5 Bardons & Oliver (1942)
No. 1-H Libby, Extra Long Bed (1942)

MILLING MACHINES
No. 3B Milwaukee Plain
12"x36" Cincinnati Universal (1945)
No. 5 Cincinnati H.P. Plain
No. 3 Cincinnati Universal
No. 2M Cincinnati Vert. (1941)
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cincinnati Mfg. (1943)
No. 2—18" Cincinnati Rise & Fall (1941)
No. 2—18" Sundstrand-Electromill (1942)
No. 3-24 Cincinnati Hydromatic (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 54-72 Cincinnati Hydromatic
No. 56-80 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model LT (1943)
10"x48" Hanson-Whitney Thread (1942)
12"x24" H.T. Lees-Bradner (1942)
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x8' Travelling Col. Face Millers (1942)
No. 28-60 Cincinnati Hydrotel
No. 36—120 Cincinnati Horizontal Hydrotel

MISCELLANEOUS
36" Ohio Shaper
16" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinnati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads
144"x78"x48' Liberty Openside Planer

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Model No. 60, Kane & Roach, Wrapping Type, with 40 HP Motor. Machine Serial No. 201784.
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1—Monarch Engine Lathe, 16" swing, 48" bed.
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Aluminum patterns for V-belt Sheaves, 1 to 4 grooves, 3.0 to 18.4 and miscellaneous B and C patterns.
1—500 pound Campbell-Hausfeld Tilting Aluminum Furnace. Brand new, never used.
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SHEET METAL MACHINERY
NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.
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#130 CLEVELAND RIGIDHOBBER 8" max. gear dia., 8" travel. Late Model—Excellent Cond.
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AIR COMPRESSOR
Ingersoll-Rand Type ES-1 Air Compressor, (1942) 1,000 Cu. Ft. per min. at 20 lbs. discharge. Complete with 75 HP Westinghouse Motor.
PRICE $2,250.00
PRACTICALLY NEW
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HEADLINERS

LATHES
14"x59" ctrs Hendey "ECM" 18-speed. AC MD, taper
16"x56" ctrs Hendey "ECM" 18-speed. AC MD, taper
18"x96" ctrs Lodge & Shipley Selec. Grd. Hd., AC MD
24"x84" ctrs American Hvy. Pat. Grd. Hd., AC MD, taper
24"x102" ctrs Lodge & Shipley, Turner Drive, taper

MILLERS
#1-B Milwaukee DOA Plain, AC MD
#2-18 Cincinnati Automatic "Rise & Fall", new 1942
#2 Cincinnati Universal, Turner Drive
#2-A Brown & Sharpe Universal, AC MIB, div. hds.
#2-B Milwaukee Universal DOA, AC MD, div. hds.
#2-B Milwaukee Plain DOA, AC MD
#4 Cincinnati H.P. Universal, Lima Drive, div. hds.
6"x36" Model LT Lees-Bradner Thread, new 1942

PLANERS
22"x22"x6' Cincinnati, 1 head, B.D.
28"x28"x8' Cincinnati Tu-Speed, AC MD, 1 head, box table
30"x30"x18' Whitcomb, AC MD, 2 heads
36"x36"x16' Gray, AC MD, 4 heads
36"x36"x16' Gray Extra Heavy Pattern, B.D.
42"x42"x10' Niles-Bement-Pond, B.D., 3 heads, box table
42"x42"x14' Niles-Bement-Pond Heavy Pattern, D.C. var. speed drive, 4 heads, box table
72"x80"x14' Cleveland Openside, D.C. var. speed with A.C. generator, 3 heads

BORING MILLS
36" Bullard "New Era" VTL, SPD
36-44" Niles-Bement-Pond VTL, arr MD
42" Bullard "New Era" VTL, AC MD
48" Gisholt, arr MD, 2 rail heads
#3A Universal Horz., 3" bar, SPD

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Fill your Machine Tool Requirements from our large stock. Here are a few representative items.

48"x26' c.c. American "Super Productive," lathes, 2.
10"x20" Monarch EE lathe, taper, collets, '41.
#4 Warner and Swasey turret lathe, presel., bar, chuck, '43.
36" Rogers Vert. Turret Lathe, '42.
#2G Kempsmith Univ. Miller, '43.
10"x24" Landis Univ. Grinder, type C, '42.
#34 Abrasive Vert. Surface Grinder, late.
6"x18" Norton Surface Grinder, late.
1½" Landis dble. hd. threader, leads, '44.
3" Gleason bevel gr. generator, '42.
#75A Fellows gearshaper, '41.
#1212A Jr. Excello borer, 4 hds.
#45 Giddings and Lewis 4½" horiz. mill.
3" Universal horiz. boring mill.
#2MS Leland Gifford 3 spdle. drill.
#1½ Doelger and Kirsten alligator shear, '48.

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BARBER COLMAN Type "T" Taper Spline Gear Hobber

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3" Univ. Table Mill, 40" vert., 72" hor.
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11" Reinecker Bevel Spiral & Helical Gear Hobber A.C., M.D.
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (1)
No. 9J Gorton Elec. Duplicator, 1944
Gear Cutter, No. 13 B. & S., spur & bevel
30"x120" cen. Axelson Lathe, T.A.
30"x120" Hanchett Pianto Surface Grinder
No. 2 Stand. K. & T. Univ. Miller, Timken
Gear Cutter, No. 13 B. & S., spur & bevel
12"x48" Hanchett Vert. Spin. Surface Grinder
72" Gardner #179 Vert. Spdl. Hor. Disc Grinder
96"x96"x24' N.B.P. Planer
6' 17" col. Carlton Radial, M on arm
Barnes Combs. Boring and Honing Mach. up to 10' bore by 6" hole. Late.

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54" Bullard Vert. Turret Lathes (2), latest type
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3" Universal Horizontal Boring Mills (2)

40"x15' LeBlond Engine Lathe, latest type
Bullard Multaumatics, 16", 12", 8", late
Sgl. Spdl. Clearman (1949)
Sibley (1941) Drill Presses, #5 M.T.
#28/60 Cincinnati Hydrotel 4 Spdl., '44
9/16", 2¼", 2⅝" RA6 Acme Gridley Auto.
20" Gould & Eberhardt Shaper
Hardinge Multipurpose Chucking Machine, 1950
60" Bickford Vertical Boring Mill
75 Ton Henry & Wright Dieing Press
Kane & Roach 5 Station Roll Former

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GRINDER—Cincinnati 12"x36" Universal
GRINDER—Heald 72A3 Internal Universal
THREAD GRINDER—J & L 6"x3" Internal
THREAD MILL—Hanson Whitney 8"x16"

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CINCINNATI: #3 Vertical M.S.
CINCINNATI: #2M Vertical, Rotary table
CINCINNATI: 0-S Vertical
SUNDSTRAND: #6 Rigidmill—Duplex (for milling cam tracks in propeller hubs or similar work)
SUNDSTRAND: #00 Rigidmill—Hydr.
SUNDSTRAND: #8 Rigidmill
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-00 Duplex Spline
TAYLOR-FENN: Vertical
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller

THREAD MILLERS & TAPPERS
HANSON-WHITNEY: 8"x18" Thread
MOREY: 12"x60" Thread Miller
LEES-BRADNER: 40A Thread Miller
HALL PLANETARY: B, C & D Thread Millers
MURCHEY: #22 Tapper, Horiz.
PRODUCTO: Hand Tapper
NATCO: Vert. Tapper 16 spindle

TOOL SHARPENERS
OLIVER: 2A Face Mill
OLIVER: 510 Drill Pointer
OLIVER: 16" Tool Bit—Template
FELLOWS: Flat Top Helical Gear Cutter

GRINDERS—THREAD
EXCELLO: #31 & #33 Ext.
JONES & LAMSON: TG-630 Ext.
JONES & LAMSON: TG840 External
JONES & LAMSON: TG1245 External

GRINDERS—CYLINDRICAL
NORTON: 8"x18" & 10"x18"
NORTON: 10"x18" 45° angle wheel head
NORTON: 12"x36" Universal
LANDIS: 18"x18" "C" Plain Hydr.
LANDIS: 18"x32" Type "D" Crankpin, Hydr.
CINCINNATI: #3 Centerless
CINCINNATI: 6"x18" Hydr. Filmatic
BROWN & SHARPE: #10 & #23 Plain

GRINDERS—INTERNAL
BRYANT: #8Y Internal
BRYANT: 10CIG Internal
HEALD: #55 Planetary
HEALD: 79A Plain
HEALD: 72AB, 72AS Plain & Univ.
HEALD: 72AS Sizematic Centerless
HEALD 72AS Sizematic
HEALD: 172 Sizematic Gap Bed
BRYANT: 112 Universal, Hydr.
BRYANT: 16-36 Hole Grinder
BRYANT: 24-36 Heavy Duty
RIVETT: #104 Tool Room

GRINDERS—RADIUS
VAN NORMAN: #73, 636, 648 DSC.
VAN NORMAN: #3½ Universal

GRINDERS—SURFACE
THOMPSON: 8"x12"x18" Type B
THOMPSON: 12"x18"x96" Type C
THOMPSON: 30"x36"x120" Type C
HEALD: #22 Rotary—12" Chuck
ARTER: A-1-6" Rotary
GARDNER: 120A Opposed Head Disc

HONING & LAPPING
BARNES: 30c H Vertical
MICROMATIC: H-310 D.E. Horiz.
MICROMATIC H-2 S.E. Horiz.
NORTON: #26 Hyprolaps
NORTON: #2Fx40" Hand
SCHRANER: External Cylindrical

GEAR & SPLINE GRINDERS
PRATT & WHITNEY: 10" single & double wheel
GEAR GRIND. MACH: GG-10 (10"x24"). Hydr. Spur Gears & Splines
GLEASON: #17 Spiral, Zerol & Hypoid Bevel
MAAG: SS30 11¾" dia.

GEAR CUTTING MACHINES
BARBER-COLMAN: #3 Hobber
CLEVELAND: #140 Hobber—1 spindle
FELLOWS: 6Z2 Shaper
FELLOWS: 6F, 6FA, 6AA, 7 & 7Z Shapers
FELLOWS: Straight Line Generator
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT: 12N Hobber

GEAR FINISHERS & TESTERS
FELLOWS: 6LSI & 15LSI Gear Lappers, External & Internal, Spur & Helical
FELLOWS: #4 Fine Pitch Shaver
FELLOWS: #12-C Spacing Tester
GLEASON: #15 Universal Tester
GLEASON: #4 & #0 Bevel Gear Testers, Hand & Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: #224 Involute Checker
RED RING: 61C-12" Gear Tester
ILLINOIS: No. 604 Tester
FELLOWS: 36M Red Liner

PRECISION BORING
BARNES: Z412 Horizontal
HEALD: 48A S.E. 2-spindle
HEALD: 47A S.E. 2-spindle
HEALD: 46B Double End

LATHES—PRODUCTION
POTTER & JOHNSTON: 24D Automatic
SUNDSTRAND: 8x18 & 12x22 Stub Lathes
LODGE & SHIPLEY: 23A Duomatic
LIPE-ROLLWAY: 15"x30" Carbomatic
LEBLOND: 25"x48" Engine Lathe, raised to swing 40"

LATHES—TURRET
BULLARD: 24", 38" Vert. Spiral Drive
GISHOLT: No. 4 and 5, Ram Type
JONES & LAMSON: 7A Saddle Type

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LELAND-GIFFORD #2LMS Deep Hole Vertical
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BAKER: 30HO 2 spindle inverted
BAKER: 21J Upright H.D.
FOSDICK: #48M Upright H.S.
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ACME-GRIDLEY: RAS 9/16" 6-spindle

MISCELLANEOUS
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GARDNER: #6 Disc Grinder
ALLEN: #2 Stud Setter
CAMPBELL: #425 Cutolator
WILLIAMS: 10" Pipe Cut-Off
TANNEWITZ: GH-36 Band Saw
RANSOME: #30 Welding Positioner
KENT: 3½" Bar Pointer
MATTHEWS: 79A Marking
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Lathes—14"x6', 8', 10'—16"x8', 3', 10'—18"x8', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' guarded head, motorized.
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x8', 24"x8', 26"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¾" from center of shaft to flatted top (1 h.p. to 15 h.p.) 3 or 9 phase, 3600 r.p.m.

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Drill—Foote-Burt No. 25 24" Hi Duty 2" capacity in steel. Motor attached.

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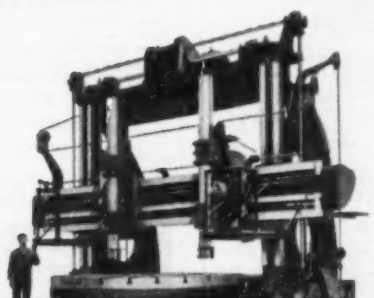

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⅜" and 1¼" Cone 4 spindle.
1-1/6" Cleveland Model M.
1⅞" Conomatic 8 spindle.
2"x18" Cleveland Model B.
4½" Conomatic 4 spindle.
No. 454 New Britain 4 spindle chucker.
No. 5 DE 2 Potter & Johnston chucker.
8" Bullard Multamatic 6 station.
14"x18" Monarch Mag-na-Matic.
14"x19" Fay.
1" Economy hopper feed shaver.

BORING MACHINES

100" Niles-Bement-Pond vertical, extra heavy.
52" King vertical.
36" Bullard vertical turret lathe.
5" Jones floor planer type horizontal.
4½" No. 33 Lucas horizontal.
3¼", No. 32 Lucas horizontal.
3", No. 31 Lucas horizontal.
3" No. 3A Universal horizontal.
Nos. 47A & 48A Heald Borematics.
No. 42 Heald Borematic.
No. 12 B Ex-Cell-O.
No. DB 2112 Ex-Cell-O.
No. 1212A Ex-Cell-O 4 spindle.
Vernon vertical miller or jig borer.
Munson double end horizontal.
No. 4 HH Baker 2 way horizontal.

ENGINE LATHES

10"x20" Monarch model EE
14"x6' Lodge & Shipley
16"x5' Sebastian
16"x10' American.
18"x6' Lodge & Shipley.
18"x8' Rockford.
20"x8' Lodge & Shipley
25"x48" centers LeBlond.
30"x16' LeBlond.
36"x16' Bridgeford.
40"x15' LeBlond heavy duty.

TURRET LATHES

Nos. 2, 4, 1A & 3A Warner & Swasey
No. 7 Bardons & Oliver.
Nos. 3, 4, 5 3AL & 28" Gishalt.
No. 4 Midland.
24" & 36" Bullard vertical.
3"x36" & 4"x34" Jones & Lamson.
Nos. 2G Morey.
No. 5 Foster.

MILLERS

No. 2H Kearney & Trecker universal.
No. 3 Cincinnati universal.
No. 3 Van Norman Duplex.
Nos. 2AS & 3B Milwaukee plain.
No. 3 Cincinnati MSDT plain.
No. 3 Ohio plain.
Nos. 2H & 3H Kearney Trecker vertical.
Nos. 2, 3 & 4 Cincinnati dial vertical.
No. 3V Van Norman vertical.
No. 3 Kempsmith Maximill vert.
No. 4 Cincinnati H.P. vertical.
Cincinnati Nos. 08, 1-12, 1-18, 2-18 & 2-24 automatic.
Cincinnati Nos. 3-24, 3-36, 34-36, 4-36, 4-48, 5-48, 56-72 & 56-90 Hydromatic
Cincinnati No. 34-36 duplex Hydromatic
Cincinnati Nos. 08 & 2-18 Rise & Fall
K.&T. Nos. 1H-12", M18, M24 & 12-24

SHAPERS & PLANERS

16", 20", 24" & 28" G&E shapers.
20" x 24" Gemco univ. shapers.
24" Columbia univ. shapers.
30"x24"x6' Liberty openside planer.
36"x36"x8' Gray planer.

MISCELLANEOUS

BALER, No. 23P-60 Logeman hydraulic.
BROACH, 10T, 36" stroke Colonial surf.
DRILLS, 121, 217, 314A, 315, 30H Baker.
GEAR HOBBERS, 8H, 12H, 16HS, 18H G&E
GRINDER, 12"x36" Cincinnati univ.
GRINDER, No. 34 Abrasive surface.
HAMMER, No. 5N Nazel air.
HONER, No. 307 Barnes.
LAPPER, No. 26F Norton Hyprolap
PROFILER, No. 12B Pratt & Whitney
PRESS, 1000 ton Bliss coining.
PRESS, 600 ton Hamilton forging.
PRESS, 1000 ton Baldwin hydraulic
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Fosdick 5'17" and 5'15" motor-on-arm "Economax" hydr. #6 taper, very late.

American 4'12" triple purpose M.D. #4 taper 24 speed.

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Fisher 3" floor type, vert. travel hd. 60" hor. travel col. 110", plates (very late).

Universal #24 Tri-way 2½" bar.

LATHES

Niles-Bement-Pond 48"x30' centers—Quick change Gr., Gr. Hd., Heavy duty, A.C. Motor drive—2 carriages—taper attachment—power rpd. traverse—16 spds. 2.04 to 90 RPM—used short while (late type).

Hendey 14"x54" ctrs., 12-speeds Gr. Hd. Toolroom lathe swing 16½", (late type).

Bridgeford 36"x56', 15 spd. gr. hd. 38" swing 48' C.D. mtrzd. carriage.

Monarch 20"x72" centers model "M", 16 spd. gr. hd. 22½" swing, Monarch auto. sizing controls (late).

American 30"x15' 12 spd. gr. hd. med. pattern—Hi-Duty 34½" swing—8' Centers—taper attachment.

BROACHES

American V-2, 12 ton hydraulic vertical press and broach (1945 machine) 26" stroke, 15 HP AC motor and complete controls.

Lapointe #5L horizontal hydraulic variable speed (1943 mach.) 37680 lb. push pulling cap., 52" stroke, 10 HP AC motor and complete controls (like new).

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Gleason 3" M.D. straight bevel gear generator, late.

Fellows #72 M.D. Hi-speed external and internal spur gear shaper, late, 7" dia. x 1½ face cap.

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Morey No. 2G Ram Type Plain, back geared, late, M.D. in base, hole through spindle 1-9/32", swing 14", maximum turning length 6', hardened steel ways, power feed to turret.

SHAPERS

Pratt & Whitney 6" M.D. vertical.

G & E 24" "Invincible" Plain table; 24" manufacturing 24" Hi-duty crank, M.D.

Stockbridge 20" M.D. Bk. Grf. crank Universal

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Campbell #2 Belt driven Nibbler, ⅜" cutting cap., Punch dia. ⅝".

Loy & Nawrath 10 gauge x 10'6" power press brake, 3" stroke, 10'6½" between housings.

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#2 Kearney & Trecker Plain Miller

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4'9" AMERICAN "Hole Wizard" Radial

18"x30" LODGE & SHIPLEY Selective Geared Head Engine Lathe.

No. 4H K&T Universal Miller, 1943

No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.

No. ½B P&W Two Spindle Reaming Machine.

Model W-7 BAUSH Hydraulic Multiple Spindle Drills.

20" G&E Industrial Shaper.

No. 4 W&S Ram Type Universal Turret Lathe.

Nos. 3 & 5 JONES & LAMSON Ram Type Universal Turret Lathes

32"x24"x120" ROCKFORD Hydraulic Shaper Planer, 3 heads

No. 3B B&S Dual Control Plain Miller

No. 145 CLEVELAND Rigid Hobber

No. 12 FELLOWS Gear Shaver

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AUTOMATIC SCREW MACHINE, #2 Brown & Sharpe, Cap. 1", Collet, Collet Chuck, toolposts, Coolant System, etc. FOUR.
AUTOMATIC SCREW MACHINE, #26 Brown & Sharpe, Cap. 1", 2 h.p. 220/440 volts, Collet, Collet Chuck, Coolant System, etc. THREE.
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BOREMATIC, Heald #49 Sgle. End. W/Univ. Fixture. 220/440 volts.
BROACH, Oilgear 10 Tons Horiz. 36" Str.
BROACH, LaPointe #3B, 25,000# 56 Str. 2-speed
BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95, 5 h.p., 220 volts, Four Speeds up to 2700 r.p.m. Floor model.
DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24". 15" C.C.
DRILL, Barnes 24" Self-Oiling, #5 M.T.
DRILL, Buffalo 20" #2MB Sgrd. #3 M.T.
DRILL, Cincinnati 21" Sgrd. Drilling & Tapping.
DRILL, Radial, Cinel-Blck. 3' Arm, 9" Col. #4 M.T. 12 speed gearbox. 3 h.p. 3/60/220.
DRILL, Radial, Cinel-Blck. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.
DRILL, L. Gilfords #2MB 14". 11" C.C. 3-Spdle
DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 6 speeds, 12¼" thrust. 3" Capacity in steel.
DRILL, Leland Gilford #2LMB Upright Sliding Head Two Spindle, #2 taper, 13" overhang, Independent 220 volts, 4-speed motors, Indicated spindle speeds.
DRILL, Nates #12 Multiple Spindle Motor Driven, #1 taper, 3 h.p. 220/440 motor, Arranged for 10 spindles, Rectangular head, With Nates 24" Rotary Table.
STRAIGHT BEVEL GEAR GENERATOR 3" Gleason, Serial #19804, NEW—1942, 220/440 volts motors. Gear Cabinet, Full Set of Index Gears, Segments, Auto-Index Attachment, Pneumatic Chuck Equipment, Cutter Setting Gauges & Segment Setting Gauges, Duplete Cutting Cam & Duplete Feed Cam.

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GRINDER, Blanchard #16, 26" Chuck Vert Rotary.
GRINDER, Landis Crank 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 10" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors. Built-in electrics, Hydraulic Infeed.
GRINDER, Covel #7B, 8x24 Hydraulic Horiz. Surface.
GRINDER, Norton 6x18 Hydraulic Vert. Rotary Auto. Excello Spdle.
GRINDER, Norton 6x18 Hydraulic Horiz. Surface. Excello Spdl.
GRINDER, Pratt Whitney 22" Vert. Rotary, 84" table travel.
GRINDER, Reid #2-B All-Electric 6x18 Auto. Horiz.
GRINDER, Thompson 6x18 Hydraulic Horiz.
GRINDER, Bath 10"x25" Motor Driven Universal Surface, 220/440 volts motor with centralized push button controls, Internal Grinder Attachment & Steady Rest, etc.
KEYSEATER, Mitts & Merrill #5 Giant Motor Driven, 220/440 volts motor, Capacity—24" long, 3" wide keyway, Automatic Feed.
LATHE, LeBlond 30" x 30', 220/440 motor, 12 speed head, taper attachment, steady rests, etc.
LATHE, Bridgeford 26"x14' G.C.G. 8'5" C.C. 220 volts two speed motor.
LATHE, Hardinge #30 High Speed Second Operation Machine, 1" Collet Cap, Automatic Collet Mechanism, collets, collet chucks, etc. FOUR.
TURRET LATHE, Bardons & Oliver #7 Universal Srd. Hd. Ram Type, Hydraulic Speed Selector, 2½" Cap. 10 h.p. 220/440 motor, With Chuck, toolholders, etc.
MILLING MACHINE, Van Norman #3SP Horiz. 54x12x10. Late Type.
MILLING MACHINE, Cincinnati #3 H.S. Dial Type, W/Rotary Table.
MILLING MACHINE, U. S. #MM1-8 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors, TWO.
MILLING MACHINE, Cincinnati #3 Dial Type High Speed Motor Drives Horizontal, 220/440 motor, Range: 34" x 12" x 20".
MILLING MACHINE, Van Norman #3V Ram Type Vertical, Late Type, 220/440 motors, Also stub arbors, arbor, vise, collets & cutters.
PRESS, Bliss Consolidated #5½ O.B.I. 4" Stro. 220/440 volts, 40 tons.
POWER PRESS, Bliss #84 S.S.S.A. 50 tons, 10" Stroke, 20" between uprights.
POWER PRESS, Bliss #75½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.
POWER PRESS, Bliss #3A S.S. Obls. Crank S.A. Grd. 45 tons, 4" stroke, 36" between uprights.
POWER PRESS, Niles #36 Back Flywheel, 87 Tons, 3" stroke, 10" shut hgt. 12"x14" hole thru bed. 20"x10" bed area.
WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 42" between strain bars, Two Plunger Type, 7.5 h.p. 220/440 motor.
POWER PRESS, Bliss-Consolidated #77 Open Back Gap Frame Sgle. Crank Sgle. Action Back geared, 175 tons, 10" stroke, Bed area—24" x 42", With Roll Feed and Roll Straightener.
POWER PRESS Ferracute #36 Double Crank Sgle. Action, S.S. Geared, 85 tons, 1¾" stroke, Bed area —61½" x 27½".
POWER PRESS — Bliss - Consolidated #183 - B Straight Side Obls. Crank Single Action, 45 tons, 6" stroke, Bed area—24" x 41", 15 h.p. 220 motor.

LATHE — Engine, Mackintosh-Hemphill 20"/110"x30" centers (1943)
HYDROTEL — Cinc. Vert. Mill #26/60, 4 spindles, tracer (1942)
O.E.T. CRANES—(2) 10 Ton x 52' span, floor control (NEW)

BORING MILLS—D & H 3½" horiz., floor (Bargain)
FLATHER— 30" Vertical Turret, (1 hd.), (old).
DRILL PRESS—Minster #2D, heavy duty, 2½"
LATHE—Sebastian 16"x30" centers (1944)
MILLERS—B. & S. No. 3 Universal (old)
Cinci. #3 Vertical Hi Power
Newton Vertical rotary (Rebuilt)
B&Sh #3 Univ. Mill (old)
PLANERS—N.B.P. 48"x48"x20'—4 Heads
ROLLS—BENDING—H. & J. 30'x⅝", Pyr.
Southwark 15'x3", Pyr., Vertical
Angle-Bertsch, 3"x3"x¾", Initial
SHAPER—G. & E. 24", back geared (Bargain).
SHEAR—Alligator (#2) 24" Blade, 3" Rds., etc.
THREAD MILL—Morey 12"x10' centers (1942)
PRESSES—Z & H #7—50 ton Percussion
Bliss #6—125 Ton dbl action roll feed, Scrap cutter (1942)
Bliss #78½—450 Ton 18" Stroke Bed 36"x36".

CINC. SHEAR—6'x¼" Like New—All gages.

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Foote-Burt 5-spindle Drill.
P & W 36" Measuring Machine.
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LATE MODEL MACHINE TOOLS . .

AUTOMATICS
No. 665 New Britain Chucker, 1947.
12"x21" Fay Automatic, 1942.

BOLT MACHINES
No. 5900 Manville Thread Roller, Latest
No. 3500 Manville Header, 8888D, Latest.

BORING MACHINES
42" King Vertical, 1942.
47A & 48A Heald Single End, 1943.

DRILLS, RADIAL
4'11" Canedy-Otto, 1943.
6' 12" American Hole Wizard, 1941.

GEAR EQUIPMENT
12" Gleason St. Bevel Gen. 1942.
No. 6 Gleason Rarecycle, 1941.
No. 6 & 17 Gleason Testers, 1943.
6" Red Ring Internal Shaver, Late.
No. GCL Red Ring Shaver, 1942.
No. 648A3, 615A & 61A Fellows, 1944.
No. 72 Fellows Shaper, 1943.
Red Ring Univ. Checker.

GRINDERS, CYLINDRICAL
25" x 48" Landis, Crankshaft, Like New.
16" x 36" Cincinnati Plain, 1942.
12" x 30" Landis Univ. 1941.
10" x 72" Landis Plain, 1942.
10" x 18" Norton Plain, 1942.

GRINDERS, INTERNAL
No. 72A3 & A5 Heald Rotary, 1943.
No. 73 Heald Hydraulic, 1942.

LATHES, ENGINE
42" x 192" Axelson, 1942.
27" x 96" LeBlond, 1941.
16"x54" American Pacemaker, 1943.
16"x54" Reed-Prentice, 1942.
14" x 30" Bradford, 1942.

LATHES, PRODUCTION
No. 2A LAS "Dumatic", 1942.
6" x 18" Lo-Swing Semi, Auto, 1942.
Model 18 Sundstrand, 1943.
14" x 42" Monarch "Magna-Matic", 1941.

LATHES, TURRET
42" x 36" Bullard Vertical, 1943.
No 3A Warner & Swasey, 1941.
No. 4A Warner & Swasey, M.D.
No. 1 & 6¼" x 24" Acme Univ. 1943.
No. 3 & 4 Warner & Swasey, 1942.
No. 5, 5 & 7 Bardons & Oliver, 1942.
No. 3B Gisholt, 1943.
No. 3H Libby, Late.

MILLS, PLAIN
No. 2B Brown & Sharpe, 1941.
No. 5 Cincinnati, 1943.
No. 4 Van Norman, 1943.
No. 2B Van Norman, 1942.

MILLS, PRODUCTION
No. 1-14 & 2-20 Kent Owens 1943.
M-18 Kearney & Trecker, 1942.
No. 1224 Kearney & Trecker, 1942.
No. 3-36 Cincinnati Duplex, H. & F. 1942.
No. 3-36 Cincinnati Hydromatic, 1942.
No. 1-18, 2-18 & 3-36 Cincinnati, 1943.

MILLS, THREAD
12" x 54" Lees Bradner, 1943.
6" x 24" Lees Bradner, 1942.
4" x 9" Hanson Whitney, 1942.

MILLS, UNIVERSAL
No. 2MH Cincinnati, 1942.
No. 2H Milwaukee, 1942.
No 2BU Van Norman 1943.

MILLS, VERTICAL
No. 2H Milwaukee, 1942.
No. 2 Cincinnati, 1942.
No 1 Cleveland 1942.

PRESSES
50 Ton Denison, Hyd., Str 1942.

SHAPERS & PLANERS
20" Cincinnati Plain, Late.
25" Smith & Mills Univ. 1945.

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1961 S. Meridian St. • • Indianapolis, Indiana

BORING MILLS—Horizontal
LUCAS #41, 3" bar, Table Type. Latest Type
NILES-BEMENT-POND 5", 8" bar, Floor Type. M.D.
SELLERS 5" Bar Table Type, latest type
BORING MILLS—Vertical
BULLARD 24", 36" 42" Vert. Turret "Spiral Drive" High Speed, Latest Type
NILES 100", 2 swivel heads, Rapid Traverse, AC M.D.
GEAR CUTTING EQUIPMENT
BARBER COLMAN Type A Hobber. Latest
FELLOWS Model 6I, 6IA, 6Z2, 7A, 72, 72S, 77 High Speed Gear, Shaper, Latest Type
GLEASON #16 Hypoid Spiral Grinder, Latest Type
GLEASON 3", 12" straight bevel generator, latest type
GLEASON 24", 37", 77", 96" Straight and Bevel Gear Planer, Motor drive
GOULD & EBERHARDT 96H Hobber, with diff. M.D.
NEWARK #3, 72" Hobber with Infeed and Diff. M.D.
PRATT & WHITNEY 16" Grinder, hyd., latest
GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
CINCINNATI 16"x36" Model E.R., Univ., Latest Type
LANDIS 4x12, Type H, Plain Hyd., Latest Type
LANDIS 29"x130" Plain Roll, Motor Drive
NORTON 6"x18", 6"x30", 10"x72" Type C, Plain, Latest
GRINDERS—Miscellaneous
BRYANT #3, #6, 16-C-16, 16-CP-16, 23-36" Internal, Hydraulic, Latest Type
FITCHBURG 14"x25" Spline hydraulic, latest
HEALD 72A3, 72A5, Internal, latest type
VAN NORMAN #639, #73 Osc. Radius Grinder, Latest
VAN NORMAN #666 Crankshaft ReGrinder, Latest
GRINDERS—Surface
BLANCHARD #11, 16" dia. mag. chuck, Latest
BLANCHARD 16A Vertical, Dial Feed, Motor Drive
HANCHETT Series 300 13"x48" Vert. Hyd., Latest
HANCHETT #120 30x120" Plano, Hyd., Horiz. Latest
HEALD 25A—rotary—24" 30" chuck, Hyd., Latest
JIG BORERS
KEARNEY & TRECKER Model B Autometric, Latest
KNIGHT #4 Precision, Late Type
SOCIETE GENEVOISE (SIPP) #4 Precision, Table 19"x27", Motor Drive
LATHES—Engine and Mfg.
AMERICAN 36"x360 centers, 2 carriages, motor drive
JONES & LAMSON "FAY" 20x25", 20x55 Auto., latest
LeBLOND 21"x60" Centers, Geared Motor Drive
LODGE & SHIPLEY 18x72 centers, M.D.
LoSWING 4x60, 4x81, 8x60, 8x108, 8x34, Latest
MONARCH 22"x456" Centers 3 Carriages. Timken Bearing, Model CM, Motor Drive
NILES 36"x60" Boring "Time Saver" Timken, Latest
LATHES—Hob and Cutter Relieving
CLEVELAND 12"x16" Centers, Cutter, Motor Drive
U.S. Tool #810B, 8"x15" Centers, Cutter, Latest
LATHES—Turret
BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
GISHOLT #1L, #2L, #3L Universal, Timken, Latest
LIBBY "International" 1H5 Univ., Timken, Latest
POTTER & JOHNSTON #3DE, Timken, Latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY 2A Univ., Chucking, Latest
MILLING MACHINES—Mfg.
GRAY 84"x32"x16' Planer Miller, 3 heads, Latest Type
INGERSOLL 42"x38"x12' adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x10' Planer Type 2 heads, AC, M.D.
INGERSOL 30x24x12' adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex 42" feed, Latest
TAYLOR & FENN M80 Duplex Spline, latest
MILLING MACHINES—Plain
BROWN & SHARPE #2B, 3B, Timken, Latest Type
CINCINNATI 0-8, 1-12, 2-18 Automatic, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER #2H, 4H, Latest
KEARNEY & TRECKER 1218, 1404, Simplex, Latest
KEARNEY & TRECKER 4K, Timken, Late
MILLING MACHINES—Thread
LEES BRADNER Model LT, 6"x36" Centers, Latest
MOREY 12x30", 60", 120", 190" centers, Latest Type
PRATT & WHITNEY 4½"x12" Model C, Latest Type
PRATT & WHITNEY 6x60" Model C, Latest Type
MILLING MACHINES—Universal
BROWN & SHARPE No. 2A, 3A, 4A, Motor Drive
KEARNEY & TRECKER 2H Timken, Latest Tyre
VAN NORMAN #26, #36, Timken, Latest Type
MILLING MACHINES—Vertical
BROWN & SHARPE #2 Standard Timken, Latest
GORTON #D, 8¼D Super-Speed, Latest Type
KEARNEY & TRECKER 2K, 3H Timken, Latest
REED PRENTICE 3VG, with or without hydraulic duplicator, Timken bearing, Latest Type
PLANERS
BETTS (CONSOLIDATED) 81"x92"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
CLEVELAND 48"x48"x12' Openside, Motor Drive
NILES 96"x96"x24' 4 heads, PRT, Box Table DC MD
PRESSES
BIRDSBORO 225 ton, vert, hyd., Latest Type
CLEARING K-1200-50 Knuckle Joint, 200 ton, Latest
GLEASON 15" Quenching, Hyd., Motor Drive
LAKE ERIE 500 ton Vert. Hyd., Latest Type
SCREW MACHINES—Automatic
CLEVELAND 9/16", 1-1/16" Model A, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Latest
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AMERICAN 20" Heavy Duty, Motor Drive
DILL 20"x24" Vertical, Motor Drive
LAMAIRE 18" Vertical, Hydraulic, Latest Type
MISCELLANEOUS
AJAX 3½" Forging and Upsetting, M.D.
BARNES #172, 306H, 307, Hone, Latest
CAMPBELL #101 Abrasive Saw, Latest Type
FOSTER 4"x18", 4"x36" Superfinisher, Latest
LANDIS 2 Single Spdle. Bolt Threader, M.D.
NATIONAL 4" Forging and Upsetting, Latest type
NAZEL #4B Pneumatic Hammer, M.D.
PRATT & WHITNEY (KELLER) Type BL-2416, Type G, Copying 2 and 3 dimensional, Latest Type

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16"x60" PRATT & WHITNEY Toolroom Lathe
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20"/40"x10' NEBEL Sliding Bed Gap Lathe, Geared Head
24"x24' LODGE & SHIPLEY Lathe, 18' cc, taper, chucks, etc., MD
36"x30' bed LODGE & SHIPLEY Selective Geared Head Lathe, raised to swing 50", 22' centers, 2 carriages
No. 4A WARNER & SWASEY Turret Lathe, quick change gearbox, full length leadscrew, 1942
16"x40" R-14 SENECA FALLS Lo-Swing Lathe
4' HAMMOND Jackknife Radial, 1942, electric tapping attachment
No. 5BM FOSDICK 4 Spindle Drill, power feeds to all spindles, 1942
84" CONSOLIDATED COLBURN Vert. Boring Mill, 2 swivel heads, rapid traverse, AC—MD
No. 2 CINCINNATI Vertical, M.S.D.T., 1942, power downfeed to head
No. 3 CINCINNATI (Dial Type) Plain Mill, Vert. Head, 1941
No. 4 REED PRENTICE Vertical Milling Machine & Die Sinker, table working surface 24" x 84", 1944
No. 31 LUCAS, 3" bar, Horizontal Boring Mill
24" GOULD & EBERHARDT Shaper, rapid traverse, power downfeed, factory, MD
10" PRATT & WHITNEY Vertical Shaper, MD
No. 9A MARVEL Automatic Hacksaw, 10"x10" gap, bar feed, MD
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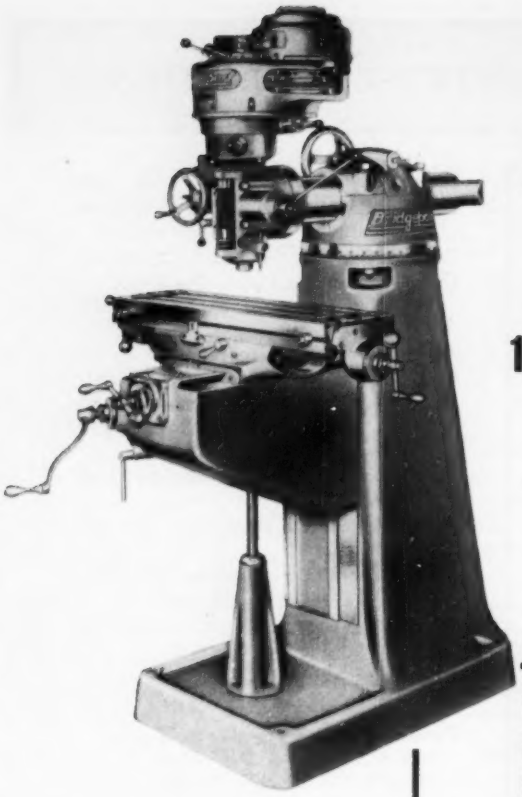

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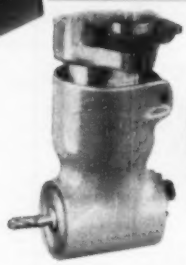

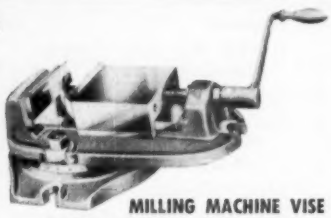

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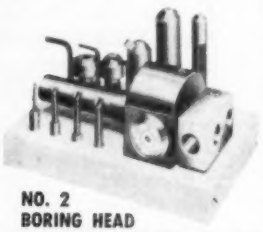

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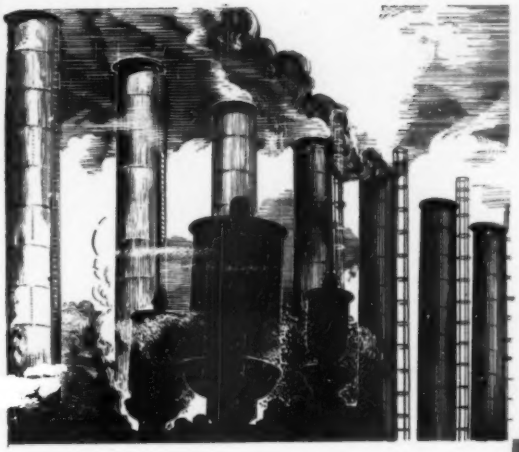

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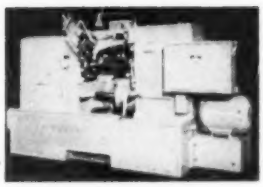
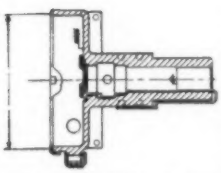


NEW BRITAIN MODEL 61
AUTOMATIC CHUCKING MACHINE



This piece is turned out on two New Britain six spindle automatics equipped with magazine and work inserters which load the die cast aluminum pieces.

The first machine performs nine operations and turns out 736.7 pieces an hour. The use of a shave tool maintains very close tolerance on the outside diameters of the stem, with concentricity held within two thousandths.

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Automatics

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MAXIMUM run-out tolerance only 75 *millionths* of an inch! That's the amazing precision achieved in the new Timken® "Double-Zero" bearing! It is twice as accurate as the Timken "Zero"—previously the most accurate Timken bearing made.

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To make these new bearings possible, Timken Roller Bearing Company engineers have built specialized machine tools, developed measuring devices of extreme accuracy and perfected new manufacturing processes.

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TYPES AVAILABLE	Standard Single Row	Standard Single Row	All types
SIZE RANGE	Up to 10" O.D.	Up to 12" O.D.	Up to 12" O.D.

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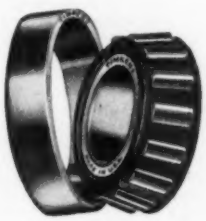

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